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The

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International Electrical Relations.

AN exceedingly interesting situation appears to be developing in connection with international electrical relations. It may be that several recently-made arrangements may be regarded as quite isolated acts, each of them designed merely to carry out the desires of separate interested parties influenced by their own particular policies. Possibly they will prove to be typical examples attending the operation of a new order of things which will emerge as the more or less inevitable outcome of changing world conditions.

Whether they are connected or disconnected, it should be possible to judge at a later stage; what is desirable is that we should note carefully what is happening in case it may influence our view of the adjustment of electro-industrial policy and procedure in the near future. We therefore in the following observations draw attention to a few recent events, leaving it to those who are able to do so to draw such conclusions as they may consider justifiable.

By way of further prefatory note, we may remark that ten years ago the war-time enactments imposed upon us the duty of subjecting to the most exhaustive analysis the constitution of large numbers of electrical manufacturing and trading companies or firms. Their directors and management, *personnel*, shareholding, foreign connections either in the form of patent or other working agreements, and many other matters had to be examined closely so that the Law might be complied with and so that Government Departments, purchasers and sellers, and we ourselves as a journal, might be perfectly sure of the correct attitude to be assumed toward anybody of probable anti-Allied predilections. We recall that these offices were bombarded by inquirers, and it seemed as though all the electrical world was finding its way here either personally, by letter, by telephone or telegraph, as the one centre of information. The experiences of this period, following upon the growing hold of Germany on the British electrical

market, formed a big factor in shaping opinion and in forming an attitude which would not be easy of readjustment as with the passage of time and the coming of altered circumstances revision or new vision might become necessary.

International connections in the old days were common in the electrical industry, and they did not always operate to the advantage of British manufacturing concerns. They were largely dispensed with as a matter of national necessity, and the electrical industry of the British Isles became more British than it had ever before been. To-day, as the outcome of changing world conditions, international connections in electrical producing concerns are again becoming quite common and more complete. Some of our companies are finding it desirable to link up in some form or other with organisations in one or perhaps several other manufacturing countries, for the better conduct of their affairs, for securing a greater measure of success, for rendering their own position in certain markets more satisfactory, or for the realisation of financial and development projects. We are not at war now, and every concern must be permitted to make its own arrangements and to work out its own salvation. There must be associated action with respect to matters of broad policy affecting electrical and allied industry, but interference with individual initiative and enterprise would undo the good work of organisation that has been effected at such pains during the past ten years. Furthermore, the British electrical and allied industries are to-day in a position vastly different from that in which they stood a decade ago, and they can face many conditions with equanimity now that then would have occasioned serious anxiety.

We strongly plead from time to time for British contracts for electrical requirements to be placed with British works and not with German, but we are informed of this, that, and the other British concern which is selling German manufactures or is using German material in the manufacture of its own product, because the cheaper cost of such material enables it to quote a competitive price and secure large contracts. The passage of time may have softened down the revulsion of the war-time in some respects, and, of course, technical achievement wherever originated is a matter of interest to all. Furthermore, it is noteworthy that Lord d'Abernon, the British Ambassador to Germany, in addressing the Hamburg Board of Commerce on the Dawes scheme and the danger of German competition to ourselves, suggested (*Times Trade Supplement*) that "as there are many articles which we can produce jointly better than they can be produced by either country separately . . . wherever possible we should co-operate." In this connection it will not be forgotten that proposals for the safeguarding of threatened industries are now before our Legislature.

British manufacturing companies have had their arrangements with Swiss, French, and American companies with reference to special matters for some years past, and the new world organisation schemes of the lamp-producing concerns in this and various other countries have been much in evidence quite lately. Perhaps the most interesting of all recent international developments have been those between the United States and Germany, and between Switzerland and the United States.

As we have shown again and again, German electrical traders are quoting against us in various foreign markets, offering long credit just as they used to do. Yet, while this is going on, German electrical industrial companies are in need of funds and are drawing upon the United States for big loans! Sir Philip Dawson, who has lately made a Continental tour, has written in a London evening newspaper stating that the German banks are once more making their influence felt in German industrial circles, taking large blocks of shares, financing industrial and commercial loans, and facilitating the giving of comparatively long credits to customers abroad. Her financiers are patiently and industriously at work, they participate in foreign banks, create foreign local companies, and all the time "America is pouring money into Germany" for Krupps, Siemens-Schuckert, the A.E.G., &c. Sir Philip holds that "peaceful penetration" is even more thorough now than it was before the war.

The help that is being given by the United States to the German electrical manufacturing industry may be a matter of first-rate importance. Directly, it will re-establish German electrical manufacturing and facilitate its return as an international competitor; indirectly, it may operate to British detriment because of the influence of American capital behind German commercial effort; and it may be that triangular British-American-German understandings will exist as in the past and possibly will be strengthened.

The first bond issue ever made outside Germany by the Allgemeine Elektricitäts Gesellschaft was made last month in New York by the National City Company. It was for $10,000,000, and consisted of 7 per cent. coupon bonds issued at a price yielding over 7½ per cent. The German Siemens group (Siemens-Schuckert Werke and Siemens and Halske) has raised in New York a $5,000,000 three-year loan and a $5,000,000 five-year loan, both bearing interest at 7 per cent. Both the A.E.G. and Siemens issues were immediately over-subscribed. Another German loan negotiated by a New York financing house was for $15,000,000 (a twenty-year loan at 7 per cent., but carrying the possibility of repayment in five years) for the Sachsische Elektricitätswerke Gesellschaft of Dresden, but this was for a large new power station at Bohlen, near Leipzig, and not for a manufacturing purpose. In our issue of February 20th, p. 293, we mentioned a number of other large loans that were floated in America last year for big electrical schemes in Austria, France, and Norway. It will be seen, therefore, how large a financial hold the United States is gaining over European, and especially German, electrical manufacturing concerns. The rate of interest payable is no higher than some of our own manufacturers had to pay a few years ago when they required substantial sums for new capital purposes.

Following upon the A.E.G. and Siemens loan successes, there comes a report, dated February 18th, through *The Times* New York correspondent, stating that the "Westinghouse and the Siemens & Halske electrical interests have made a ten-years' patents, experience, and practice" agreement for mutual benefit. The writer attributes to Mr. Max Haller, the treasurer of the German company, the statement that "while this agreement provided for the exchange of information and services between the two organisations, it did not mean the invasion of the American market by the German concern." "The tariff," he added, "was too high for that." So that while the Siemens loans were issued to the general public by the financiers, the Siemens and Westinghouse concerns are acting in co-operation along certain indicated lines.

But while the States is helping Germany to get upon her feet by lending big money to her electrical manufacturers, American electrical manufacturers are lifting their eyebrows at the action of a world-renowned Swiss manufacturer who has crossed the Atlantic and dared to commence elaborate operations on American soil. Last week (p. 293) we quoted the *Electrical World* which voiced the interest with which "the final results of this move of one of the largest electrical manufacturers in Europe" were awaited. Our contemporary said that much curiosity existed regarding which American firms were to be absorbed by the Brown-Boveri interests at an expenditure of upward of $50,000,000. The *Times* New York correspondent already referred to provides part of the desired information, for he says that Messrs. Brown, Boveri have offered to purchase the control of the Wagner Electric Corporation, which has a factory at St. Louis. They are also said to be negotiating for the purchase of Messrs. William Cramp & Son, ship and engine builders, Philadelphia. We stated a few weeks ago (Elec. Rev., February 13th, p. 255) that Brown-Boveri were beginning operations in the States because the directors of various American railway and operating companies had

invited them to provide efficient competition with the practical monopoly hitherto possessed by the big American electrical firms. The new Swiss-American concern hopes to play an important part in connection with forthcoming railway electrification and hydro-electric works.

We have summarised in the foregoing some of the latest world electrical changes. Others are in process of development, some of which may further the influence of British concerns in other countries or widen the area of co-operative understanding between British and foreign producers. International co-operation sometimes takes the form of demarcation of market activity, limiting spheres of influence or dictating a policy of action or inaction according to the circumstances. While the productive electrical capacity of ourselves, of America, of Germany, and of France continues, in consequence of war-time works expansion and new methods, to be so largely in excess of world demand, international understandings and co-operative policies may be accepted as reasonable and possibly necessary, but what will be their utimate effect in the aggregate upon British electrical production and our electrical trade in overseas markets it is impossible to foresee.

The Internal-Combustion Boiler.

SOME time ago there were references in the daily Press to the invention of a wonderful boiler, by means of which it was said to be possible to impart to the steam more heat than the fuel originally contained. It would not be right to say that engineers have long been looking for such a boiler, nor indeed have they entertained any hopes that it would be discovered until Nature could be induced to give something for nothing, and "perpetual motion" could be obtained without waste of energy. In spite of the fact that these two preliminaries are still wanting, Mr. Oscar Brunler is making perfectly definite claims for an efficiency of more than 100 per cent. for a boiler of his design, and, what is almost equally surprising, his claims were taken seriously enough to be thought worthy of discussion at a joint meeting of the Institution of Chemical Engineers and the Chemical Engineering Group of the Society of Chemical Industry on February 11th. Convinced as Mr. Brunler undoubtedly is that he has produced a boiler which, although unlagged, will work with an efficiency of well over 100 per cent., the evidence he produced of having done so was unconvincing to the last degree. His paper contains no details of any actual test, but he gives instead a sort of calculation which we must confess ourselves unable to follow. As regards his test results, we have simply to choose between the belief that these are inaccurate and the belief that the accepted calorific values of oils are grossly wrong, unless we are prepared to reject the whole principle of the conservation of energy and disbelieve the accumulated knowledge of physical phenomena.

What Mr. Brunler has done is to construct a boiler in which heat is imparted to the water by a submerged flame of the blow-lamp type, produced by the combustion of oil in a blast of air. It is directed vertically downwards, and when it is established the water level in the boiler is raised so as completely to drown it. The flame will continue to burn under these conditions, its heat being imparted directly to the water by contact. The steam generated is of course mixed with the nitrogen, carbon dioxide, and other incondensable gases derived from the air used for combustion, such gases forming, it is stated, 40 per cent. of the output of the boiler. To keep such a boiler going involves the use of large air compressors capable of supplying the whole of the combustion air at a pressure greater than that of the boiler. This is a pretty serious matter from the point of view of power alone, even though the work of compression is partly recoverable from the expansion of the gases in the engine. Furthermore, the steam could not be used in a condensing engine, because of the large proportion of incondensable gases it contains, and consequently the system is ruled out for power-station work.

Factory Lighting.

A GOOD instance of the propaganda now being carried out in favour of better lighting was afforded by Mr. L. Gaster's lecture at the Polytechnic on February 17th. This lecture, which dealt with industrial lighting, was one of a series organised by the Department of Industrial Administration at the Polytechnic, under the auspices of the Industrial League and Council. It thus afforded a valuable opportunity of bringing this matter before the notice of the industrial councils of the leading industries. Mr. Gaster emphasised the great value of the work that such councils and their research departments can do in studying the needs of their respective industries in lighting matters. Whilst certain general principles of good lighting can be laid down, each industry presents problems of its own which can only be completely solved with the co-operation of workers and employers. Illumination, in fact, affords a particularly good field for their joint efforts, since good lighting is of benefit to management and workers alike. After summarising the recommendations of the Departmental Committee of the Home Office dealing with lighting in factories and workshops, the lecturer pointed out that legislation was necessarily based on considerations of health and safety; but the representatives of every industry should recognise that efficiency was also dependent on good illumination, and make every effort to eliminate handicaps to the worker arising from inadequate lighting.

U.S. Electrical Exports.

THE American Bureau of Foreign and Domestic Commerce recently issued statistics showing the values of electrical exports for the complete year 1924, compared with those for the preceding year. There were certain changes in classification, but these alterations do not affect the total finding, which shows an advance from $71,646,796 to $82,082,141, that is, an increase of nearly 10½ million dollars, or well over £2,000,000 during the twelve months. The figures are set out in the *Electrical World* for February 7th, and an examination of the different items reveals the fact that radio and wireless apparatus was exported to the value of $6,030,914 ($3,448,112 in 1923), representing greatly increased activity. For the month of December alone the exports of these goods amounted to $1,080,168, as against only $335,308 in the corresponding month of 1923. Telephone switchboards and equipments form another class in which there was a very substantial rise, while electrical carbons, carbon brushes, and electrodes likewise made progress, and there were big leaps in transformers, in switchboards and switchgear, in electric fans, and in electro-therapeutic apparatus.

Wiring Regulations.

ON another page Mr. F. W. Purse, M.I.E.E., a member of the Wiring Rules Committee, makes a spirited defence of the new "Regulations," largely on the basis of the Rules issued by the Hydro-Electric Commission of Ontario, which are backed by statutory authority. British contractors, we think, will be thankful that they do not work under a system which apparently involves continual reference to the Commission for approval not only of all electrical equipment, but also of plans and specifications, and even requires a permit to be obtained (at a fee) before work can be commenced. The issue of a book of nearly 200 pages is suggestive of the red tape inseparable from Government control, and we are disposed to the view that the most effective defence of the I.E.E. code was that put forward, at a meeting which must not be particularised; by a speaker who must not be identified, who warned its critics that if voluntary regulations were rejected, a Government department might take requisite action.

It will be observed, from the examples quoted by Mr. Purse, that the Ontario rules—expressly intended to provide a *minimum* standard—are elementary and in some cases even primitive; they were devised to suit the local conditions, and offer no criterion by which to judge our own, which appear to have been formulated to provide a maximum standard.

K

Wiring Regulations.

By FREDK. W. PURSE, M.I.E.E., M.I.Mech.E., Chief Engineer, West Ham Electricity Department.

THE issue by the Institution of Electrical Engineers last year of the Eighth Edition of the Regulations for the Electrical Equipment of Buildings (formerly I.E.E. Wiring Rules) has provoked certain criticism, but this was natural, and one might say inevitable, as there have been, are, and always will be, people who desire to be a law unto themselves, and there has yet to be born the person or persons who can produce a code of regulations of the nature under consideration that will give satisfaction to everyone.

Practically all other points of criticism have come from very interested persons who are selfish enough to imagine the harm the regulations might do to them personally without calculating the amount of good they can do to the industry as a whole.

To listen to the whining of these critics one would imagine that there never had existed any rules or regulations before, but it is just as well to remind them that the Institution published the first edition in 1882, the second edition in 1888, the third edition in 1897, the fourth edition in 1903, the fifth edition in 1907, the sixth edition in 1911, and the seventh edition in 1916.

In the seventh edition is the following note:—

> "In order that the Wiring Rules may conform with the developments of Electrical Practice, the Council has constituted the Wiring Rules Committee a Standing Committee, and any specific amendments to the rules which may be suggested will receive consideration."

The fact that the seventh edition was under revision was common knowledge, but it is correct to say that the note referred to above has been almost entirely ignored by the present critics.

Reference is often made to the generally satisfactory wiring work which has been carried out up to the present time, and the reason is evident, *viz.*, that the Institution has from the inception of the electric supply industry issued and *kept up to date* wiring regulations, and as developments have taken place, so have the Regulations been revised, and as substantial developments in the use of electricity have taken place since 1916, the revised Regulations comprised in the Eighth Edition were overdue.

The critics seem to have an idea that but for the Institution Regulations they would be absolutely free to do as they like, but it is as well to remind them of the following:—

Section 18 of the Electric Lighting Act, 1882.

Section 27 (paragraphs 4 and 5) Electricity (Clauses) Act, 1899.

Board of Trade Regulations.

Home Office Regulations for Factories and Workshops; and other special regulations, such as those for mines, kinematographs, and the L.C.C. Regulations for Places of Amusement.

Last, but not least, there have been the Special Regulations issued by different fire offices, so that under them all it has been very difficult for the wiring contractors to know what standard to work to.

The Eighth Edition can be said to fairly cover all requirements, excepting special conditions, and the acceptance by the Contractors' Association of the new regulations is evidence that a want has been supplied.

The statement is repeatedly made that the gas industry does not suffer under such restrictions, but the following extract from an editorial in the *Gas Journal* of January 30th, 1924, is interesting:—

> "There are now in existence several Private Acts which confer the necessary authorisation to specify piping and fittings, to inspect and to refuse to supply gas in inappropriate circumstances. One of the latest examples is the Macclesfield Corporation Act of last session."

Then follows a reference to the various powers contained in the Act, and the article concludes with the following comment:—

> "The powers, we repeat, are not original; but the Act provides one of the latest examples. *It will be a good thing when the possession of such powers becomes more general.*"

Even the gas industry recognise the wisdom of having proper rules and regulations for their installations and for their being compulsorily enforced.

Let us now see what our Canadian friends are doing in this matter.

There is in the province of Ontario the Hydro-Electric Power Commission, which is responsible for the whole of the generation and main distribution of public electric supply, the retail distribution being left in the hands of the many municipalites throughout the province.

In Ontario the electricity supply is considered to be of the "cheap and abundant" variety owing to the plentiful supply of water power and to the generation being concentrated under one controlling body.

In order, however, to extend the benefit to rural districts, special financial aid has been given to the Hydro-Electric Commission, as will be seen from the following extract from the statement issued by the chairman of the Commission last year.

> "The Ontario Government, having long recognised the benefits of hydro-electrical energy to the agricultural industry of the Province passed in 1921, legislation authorising the bonusing up to 50 per cent. of their cost of rural *primary* lines on highways throughout the Province; in 1924 further legislation authorising the similar bonusing of rural *secondary* lines was enacted. Under existing legislation the Government of the Province of Ontario now pays 50 per cent. of the cost of all construction of rural lines in connection with the distribution of power to rural communities throughout the Province."

When one realises that the Government pays 50 per cent. of the cost of developing the rural supply, it would be natural to expect that there would be an entire absence of any restrictions or regulations in connection with the user's installation.

What do we find, however? As recently as June, 1924, the Hydro-Electric Commission issued its Seventh (Revised) Edition of Rules and Regulations covering electrical installations for buildings, structures and premises covering potentials from 10 to 5,000 volts.

This publication contains 133 pages of closely-printed regulations and 65 pages of appendices, making 198 pages in all.

The book also contains a copy of the Act authorising the Commission to enforce its rules and regulations.

Let us now make a general survey of the Rules and Regulations.

In the preface it is stated that the object of the rules and regulations is to provide a *minimum* standard for electrical installations and material.

The rules state that they must be rigidly adhered to, and the Commission may require any existing installation to be put into a reasonably safe condition.

All electrical equipment must be approved by the Commission, plans and specifications of all large power and lighting installation work must be approved by the Commission, and *before any installation work* is commenced a permit must be obtained and a fee paid to the Commission. Other general conditions are given, but are too lengthy to quote.

The following are some of the regulations taken at random, and in reading them it must always be borne in mind that *all equipment* must be first approved by the Commission:—

Motors.—Each motor must be provided with proper starting equipment.

All forms of starting devices for motors of over 5 h.p. must be equipped with some form of automatic low-voltage release.

Conductors carrying the current of only one motor must have a current-carrying capacity of at least 110 per cent. of the name-plate current-rating of the motor.

Switchboards.—Panels of switchboards must be made of incombustible, non-absorptive insulating material.

Switchboards must be installed only in dry places.

For potentials from 150 to 650 volts switchboards must be surrounded by an insulating flooring such as wood or rubber mats, or else all live parts must be remote from access or suitably covered.

Apparatus.—An automatic overload protective device (fuse or circuit breaker) must be provided for the protection of each ungrounded wire at every point where a change is made in the size of wire.

Open-link fuses must not be used.

Where automatic overload circuit breakers not under competent supervision are used, fuses must be provided in addition.

Gasfilled Incandescent Lamps.—Must not be used in any location where liable to come in contact with inflammable material unless installed in fixtures equipped with shades or guards designed to operate at a safe temperature.

Fixtures.—Fixtures must not be used on circuits having a potential of over 150 volts to ground.

Chains carrying the weight of large lighting fixtures suspended in theatres, halls, churches, &c., must have solid links. This rule does not apply to fixtures of less than 30 lb. in weight.

Wiring.—Wires must not be of smaller size than No. 14 B and S gauge except as permitted for pendants, fixtures and portables.

Wires must not come nearer than six inches to any other electric lighting, power or signalling wires, not protected by conduit, raceway, armouring or flexible tubing, without being permanently separated therefrom by a continuous and firmly fixed tube of non-conducting material.

Push-buttons for bells, gas-lighting circuits and the like, must not be placed on the same wall-plate with switches controlling electric light or power circuits.

Insulated wires where closely grouped as in the rear of switchboards must each have a substantial flame-proof outer covering.

Distribution.—In houses of five rooms and upwards wiring must be sub-divided into not less than two branch circuits and each circuit must have approximately the same number of outlets.

Metal Conduit Work.—No metal conduit having an internal diameter of less than ½ in. must be used.

Wire used in conduit must have a rubber, varnished cambric, or slow-burning insulation.

The two or more wires of a circuit must always be contained in the same conduit.

Wiring under special conditions such as damp places, where inflammable or explosive materials are present, theatres, electric cranes and elevators, electric signs, &c., have further additional regulations specified.

Grounding.—Otherwise "Earthing," is governed by a series of special rules.

As a concluding note the Regulations state that:—

"In some Municipalities the local Electricity Supply Authorities have special regulations of their own and it is recommended that contractors, wiremen and others interested, inform themselves of local requirements before commencing any work."

The above are only a few specimens, and when it is remembered that in cases over 150 volts, additional precautions have to be observed and that the final interpretation of any of the regulations rests with the Commission, and that under its Act it is "not liable for any injury, loss, or other damages caused to any person or property by reason of defects in any of the work or matters mentioned in the regulations, or by reason of any order of the Commission notwithstanding any inspection or test or the issue of any certificate by the Commission or by any of its inspectors or other employees," then it is no exaggeration to say that the critics of the I.E.E. Regulations must have scanned them through very dark glasses indeed.

How can they reconcile the fact on the one hand that the Province of Ontario is so anxious to develop the supply of electricity that it heavily subsidises all rural supplies, but on the other hand, endorses by legislation such regulations as are referred to above?

The answer of Ontario will be the same as that of the I.E.E., *viz.*, that a great deal of the success, safety, reliability, and prosperity of electricity supply is due to the insistence upon a good installation being carried out in the first place.

When the cobwebs of prejudice and vested interests have been cleared away, there remain two definite issues, the one entirely opposed to any rules or regulations, and the other recognising the necessity of these.

The former can be dismissed without further ado, and when one comes to the latter the question arises as to how to give effect to it. Is not the premier Institution of the industry the right and proper body to take such a work in hand and, having done so, can it be said that the Committee of 35 which has been entrusted with the work is not thoroughly representative of all sections of the industry?

The result of its labours is seen in the Eighth Edition, and it has been produced in no haphazard manner, but each regulation has been considered in relation to the remainder, and the views of all representatives carefully considered before coming to a decision.

The constitution of any body or association is built up and maintained by the loyal adhesion of the minority to the expressed desires of the majority, and by this minority adopting proper constitutional methods in attempting to convert others to its way of thinking.

Progress and success have never been attained by defiance or splendid isolation; so the Institution must not be thwarted in its endeavour to maintain a proper standard in the matter of electrical installation work, and any objectors will best serve the Institution and industry to which they belong by making any helpful suggestions in a proper manner through the usual channels, always remembering that construction is better than destruction.

The Wireless Telegraphy Bill.

By W. H. STOKER, K.C.

THE new Wireless Telegraphy Bill, or to give it its full title and scope: "*A Bill to re-enact and amend the law relating to wireless telegraphy, and to make provision with respect to visual and sound signalling, and the use of etheric waves for the transmission of energy,*" is not, like its predecessor the Wireless Telegraphy Act, 1904, legislation of limited duration, requiring Parliamentary recurrent renewal, but will, if it becomes law, be permanent until repealed or amended. Its provisions require, therefore, the more careful scrutiny.

With this in mind, it is proposed to examine the new Bill, and see what is pure re-enactment, how far this is desirable, what is amendment, and what is extension into further fields of interference with or regulation by Government of individual enterprise. Also, to what extent such interference or regulation is delegated to departmental jurisdiction. Departmental regulation has some advantages of convenience, but it has also many drawbacks. In any case it should be coupled or associated in the first instance with expert and practical intelligence and advice, and in the second with effective Parliamentary supervision. The Postmaster-General, to whom the Bill proposes to delegate functions of control and regulation, may have skilled technical advisers, but if these are to be departmental officials they cannot be expected to be in that full and close touch with the technical and practical world which is so essential to the value and authority of their advice. Their counsel is bound, moreover, to be more or less tinged with or affected by departmental and bureaucratic considerations, and there is no appeal against the issue of regulations based on their *ex parte* advice except by the cumbersome and belated procedure of an Address by Parliament praying disallowance by His Majesty in Council. The very highest degree of up-to-date scientific and technical knowledge is a necessary condition of departmental legislation and control in such a matter as wireless telegraphy and its scientific developments.

The Bill, in the first instance, re-enacts the provisions of Section 1 of the 1904 Act, prohibiting the working of

wireless telegraphy except under licence granted by the Postmaster-General. There is but little variation in or amendment of the older provisions. The words "or maintain," "or is being maintained," and "or maintained" are added to the establishment, installation, or working of apparatus for wireless telegraphy. Aircraft is added to the places of establishment requiring licences, and the Air Council is added as an authority for proceedings for breaches, or for searches, by warrant of a justice of the peace. The provisions authorising search for unauthorised apparatus are not new, are, or should be, safeguarded by the condition precedent of a magistrate's warrant on sworn information on behalf of the Postmaster-General, Admiralty, Army Council, or Air Council, are not unusual, and appear to be reasonable if the safeguards are strictly interpreted.

Outcry has been raised in the daily Press against these provisions, but this appears to be based to some extent on ignorance of the existing law, and also on the view that apparatus capable only of receiving, such as crystal sets, and not of transmitting, have been hitherto immune from proceedings under the Act. There is no doubt authority for that view, as in the definition clause in the 1904 Act of "wireless telegraphy," a proviso is contained that "nothing in the Act shall prevent any person from making or using electrical apparatus for actuating machinery or for any purpose other than the *transmission* of messages."

Different views have been held, and expressed, as to the effect of this, and as to whether the expression *transmission* necessarily includes *reception*. If it does not, and there has been no legal decision on the point, then the present Bill, by its deletion of this proviso, removes any chance of immunity of crystal receivers, and to that extent Clause 1 of the Bill effects material amendment of the existing law. That there is substantial ground for the view that purely receiving apparatus, such as crystal receiving sets, are protected by the proviso to the definition in the 1904 Act, is shown by the introduction (in Clause 11 of the new Bill) of a provision declaring that to remove doubts as to construction of the 1904 Act, any references therein to transmission in relation to messages shall be deemed always to have included references to the reception of messages, and it proceeds to save persons liable to penalty for any act or omission prior to the 12th of December, 1924, from prosecution therefor. It may be noted here that even with the elimination of this proviso therefrom, the wording of the definition of wireless telegraphy refers only to systems of communication by telegraph and "messages" or communications. Applying the *ejusdem generis* canons of construction, and bearing in mind the object of the Telegraph Acts and the monopoly in telegraphic messages thereby given to the Postmaster-General, a question may well arise whether the transmission, or reception, of purely musical performances, apart from any announcement of them, is transmission or reception of a message or communication in the nature of a message? The introduction of the new Bill is surely an opportunity for setting at rest any doubts on this point also.

But the elimination of the whole of the proviso to the definition section in the 1904 Act raises yet other questions, especially when considered with an entirely new provision introduced by Clause 7 of the Bill. This is as follows:—"The provisions of this Act shall apply to the installation and working of apparatus for utilising etheric waves for the purpose of the sending or receiving of energy without the aid of any wire connecting the points from and at which the energy is sent and received as they apply to the installation and working of apparatus for wireless telegraphy."

Under the proviso to the definition clause in the 1904 Act, electrical apparatus for actuating machinery or for any purpose other than the transmission of messages was exempt. But the combined effect of the elimination of this proviso and of the new Clause 7 would seem to extend the authority of the Postmaster-General to all kinds of enterprises and industries entirely distinct from his proper sphere of control, and to include many kinds of operations entirely innocent of any true connection with wireless telegraphy. It also exposes such enterprises or industries to the full gamut of Clause 3 of the Bill empowering the Postmaster-General to make regulations enforceable under penalties, which are of a very inclusive character. Attention has already been drawn to the possible scope and effect of Clause 7 in a humorous but also serious letter from Mr. Campbell Swinton to the *Times* newspaper, and it is certainly of a dangerously sweeping nature.

Clause 2 (1) of the Bill relates to licences for experimental purposes, and re-enacts Sect. 2 (1) of the 1904 Act, but whereas Sect. 2 (6) of the 1904 Act merely empowered the Postmaster-General to make regulations for prescribing the form and manner in which applications for licences should be made, Clause 3 (1) of the Bill enables that functionary to make regulations (*a*) as to the terms, conditions, and restrictions on or subject to which licences or any class of licences under it are to be granted, renewed, suspended, or withdrawn; and (*b*) requiring any operators or other persons engaged in working wireless telegraphy (including, of course, the utilisation of etheric waves for the sending or receiving of energy) under Clause 7, to be provided with certificates, and making provision as to the manner and conditions of the issue and renewal of any such certificate, including the examination and tests to be undergone, and the form, custody, production, cancellation, suspension, endorsement and surrender of any such certificate. It is true that Clause 2 (1) of the Bill, like Section 2 (1) of the 1904 Act, enables the Postmaster-General to attach special terms, conditions, and restrictions to experimenters' licences, but Clause 3 (1) of the Bill gives a much wider express scope for regulations. The powers of the Postmaster-General under Section 2 (1) of the 1904 Act, repeated by Clause 2 (1) of the Bill, had already given rise to well-founded complaints both as to the manner in which the Postmaster-General had exercised them, and as to his requirements in order to be satisfied as to the objects of would-be experimenters, and the increased powers now sought by the Bill to be given to the Postmaster-General by arbitrary regulations seem to point to the extreme desirability of introducing some provision for prior consultation with and the concurrence of properly representative bodies connected with the interests concerned. Clause 2 (1) of the Bill repeats the provision in Sect. 2 (1) of the 1904 Act that licences for experimental purposes are not to be subject to any rent or royalty, but a sub-clause (3) is added that this is not to prevent and shall be deemed never to have prevented fees (periodical or otherwise) prescribed for the purpose, being charged in respect of grant or renewal. It is understood that fees have actually been charged under the 1904 Act, but the authority for this appears questionable, and their exaction and the power now sought are certainly contrary to the spirit of the statement made by Lord Stanley (the then Postmaster-General) in the House of Commons on the 11th August, 1904, in Committee, that he desired to make it *as easy as possible* for people to conduct experiments, and that he therefore moved to add the words "but shall not be subject to any rent or royalty."

Clause 2 (2) of the Bill re-enacts Sect. 2 (2) of the 1904 Act in regard to licences without rent or royalty to wireless telegraph stations maintained by private persons, corporations, or companies having private telegraph wires for which no charge is made to anyone, and worked for their private use. But they fall under the same category in the Bill as regards fees as do experimenters. Sect. 2 (3) of the Act of 1904 contained a provision for the granting of licences at reduced terms for wireless telegraph stations used exclusively for transmission within the United Kingdom of news to public registered newspapers. This sub-section is omitted from the Bill, possibly as covered by the general powers to make regulations under Clause 3, but the omission of a distinct provision in the Act may be a matter for the serious consideration of newspapers, especially in view of the operations of the British Broadcasting Co. The

position of British and foreign ships and of aircraft under the Bill is defined by Clauses 1 and 9 of the Bill, and is subject to regulations under Clause 3 (1) (*c*) of the Bill, as compared with Sections 7 and 3 of the 1904 Act, and regulations by the Postmaster-General under Sect. 3 (4) of the 1904 Act. A close examination and comparison of these is beyond the scope of space for this article, and is omitted as not of sufficient special interest to readers of the ELECTRICAL REVIEW. Clause 3 (1) (*d*) of the Bill is a new provision enabling the Postmaster-General to make regulations for giving effect to, and securing compliance with, the provisions of international conventions, and needs no further notice.

Clause 4 of the Bill is a new provision, and forbids the sending of indecent, obscene, or offensive messages, or messages subversive of public order, or false or misleading signals of distress, or false or misleading messages to vessels in distress, and the improper divulging of messages. There is a penalty on summary conviction of a fine not exceeding £10, or, on conviction on indictment, of imprisonment with or without hard labour not exceeding 12 months.

Clause 6 of the Bill, which is new, applies its provisions to visual or sound signalling stations for communication with ships at sea, but excluding those on board ships or aircraft, and Lloyd's stations, and stations and lighthouses under the Board of Trade or lighthouse authorities.

Other provisions calling for notice are those dealing with punishments and penalties. These have aroused a great deal of criticism, partly through ignorance of the already existing provisions of the 1904 Act. Apart from what has already been noticed as regards the penalties for obscene or offensive messages, and false and misleading messages of distress, and the improper divulging of messages, under Clause 4 of the Bill, the penalties arise, first, under Clause 1 of the Bill (as added to by Clause 6 in respect of etheric waves) for establishing or maintaining wireless stations or installing, working, or maintaining wireless apparatus without a licence; and, secondly, for breaches of the Postmaster-General's regulations under Clause 3 of the Bill. As regards the first, the penalty under the 1904 Act was, on conviction on indictment, a fine of £100, or imprisonment with or without hard labour for not more than 12 months, or, on summary conviction, a penalty not exceeding £10, and forfeiture of apparatus in either case. Under the new Bill the punishment or penalty on conviction on indictment is the same, but that on summary conviction is a fine *not exceeding £50, or imprisonment with or without hard labour for not exceeding three months*, also with forfeiture of apparatus in either case. As regards the second, the Postmaster-General's regulations may provide a penalty on summary conviction of imprisonment not exceeding three months, or a fine not exceeding £50, and in the case of a continuing offence, a further fine not exceeding £5 a day.

As regards both sets of penalties, the Postmaster-General is empowered, in a new section (Clause 5) in his discretion to mitigate penalties without taking proceedings, and to stay and compound proceedings or the seizure and forfeiture of apparatus, and to restore anything seized or forfeited.

The only other provision in the Bill calling for notice, and it is an important one, relates to the possible disallowance through Parliament of the Postmaster-General's regulations. Under sub-clause (3) of Clause 3 in the Bill, every regulation under that section is to be laid before both Houses of Parliament as soon as may be after it is made, and if an address is presented by either House within twenty-one days on which the House has sat next after the regulation is so laid, praying that the regulation may be annulled, His Majesty in Council may annul the regulation, but without prejudice to anything previously done thereunder. This last sentence points strongly to the need, already referred to, of some provision ensuring consultation prior to the issue of unworkable or oppressive regulations.

The British Industries Fair.

ALTHOUGH this year's British Industries Fair at Birmingham has been augmented by a number of firms who have hitherto displayed their wares at the London section, the number of electrical firms who have stands is perhaps smaller than before. The decline in the representation of electrical engineering continues, although the position is levelled up to a certain extent by an increase in the stands devoted to radio products.

One branch which is notably ill-represented as compared with the Fairs of previous years is that devoted to the manufacture of lighting fittings, which has hitherto been a redeeming feature of a particularly non-electrical exhibition.

The examples of heavy electrical engineering are confined practically to small or medium-sized lighting sets, and even one of the firms exhibiting in this branch claims that its oil engines supply power at one-fifth of the cost of electricity.

We give below some particulars of a number of the stands on which manufactures of an electrical or allied nature are on view.

Messrs. C. H. Parsons, Ltd.

This firm displays examples of its "Britmac" tumbler switches and lampholders, which are all of very substantial design. Among the exhibits is a new pattern of all-porcelain switch effectively produced in black and white. Flush-type one- and two-way tumbler switches and small low-voltage tumbler switches (suitable for use with motor-car lighting) are also shown.

Messrs. J. H. Tucker & Co., Ltd.

As in previous years this company has an enclosed stand in which numerous examples of its products are displayed. The principal classes are tumbler switches, lampholders, and iron-clad switch- and fuse-gear. The chief feature of the quick-make and quick-break tumbler switches shown is that the spring is not used to make and break contact, but only provides rapid action to the movement. Various combination tumbler switches are exhibited, including series-parallel patterns for dimming lights, intermediate switches for controlling the same lamps from different points, flush switches with artistic metal plates, &c. The lampholders include plain types, for bayonet-cap or Edison screw lamps, push-bar switch lampholders, &c. Other lighting fittings shown are ceiling roses, cut-outs, plugs and sockets, &c. The ironclad switchgear includes quick-make and quick-break designs for various combinations and capacities. Fuses of various kinds and equipped switchboards complete the display. Special attention is being drawn to the detachable "Kwikwire" terminal, which facilitates the wiring of switches and other fittings.

Premier Electric Heaters, Ltd.

The principal new departure in the display of this company is a kettle fitted with a patent cut-out device to prevent the burning of the metal. This device (fig. 1) consists of a metal bridge, which is maintained across the contacts in the bottom

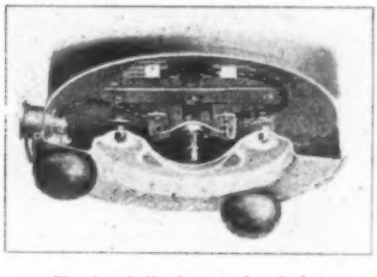


Fig. 1.—A kettle-protecting device.

of the kettle by a nut having a split sleeve. This sleeve becomes overheated when the kettle boils dry and falls apart, allowing the bridge to fall and break the circuit. A new sleeve nut can be fitted in a few moments. All the kettles shown by the company are of highly-polished or nickel-plated copper, the shapes being stamped out at the company's Birmingham

works. The safety device is particularly useful where kettles are hired out and maintenance charges are required to be kept low. We are informed that a number of municipalities have adopted it. The company again shows examples of its electric fires, irons, urns, hotplates, &c.

Messrs. Ruston & Hornsby, Ltd.

A number of crude-oil cold-starting engines are exhibited upon this stand, and, in addition, there is a 2½-kW petrol-paraffin lighting set. This has a horizontal low-speed engine direct coupled to an open-protected generator, and is of rather large proportions.

Fescol, Ltd.

This company has a stand upon which are shown many examples of its work of building up worn machine parts by electro-deposition. The examples on view include armature shafts, worm gear, cylinders, &c. The company's works and processes have already been described in our pages (ELEC. REV., June 10th, 1921, and November 7th, 1924.)

Messrs. Sturge & Baker, Ltd.

As usual, this firm shows various patterns of its electric fires, the distinctive feature of which is the boss-shaped element with parallel vertical nichrome spirals. Ball flex absorbers for electric lamp leads are also a familiar feature of this stand, but this year a new device on the same principle is exhibited. This is an arrangement for a portable inspection lamp. The flexible is taken up by a spring drum. The reverse action is checked by a phosphor-bronze pawl engaging in a recess cut in a hardened steel plate which is keyed to the spindle of the spring drum. No effort is required to raise the pawl when it is desired to wind up the cord. The device is illustrated in fig. 2. The company also shows examples of its all-porcelain switches and lighting fittings. Among the latter is a special arrangement in which the firm's cord absorber is combined with a wire runway for an electric lamp, enabling one lamp to be employed in a number of positions which, normally, would each require a separate lamp.

Fig. 2.—Flex Absorbed for a Portable Lamp.

National Gas Engine Co., Ltd.

This company shows, among other exhibits, an electric power plant. This comprises a horizontal engine operating upon town gas direct-coupled to an "E.C.C." generator rated at 43 A, 50/75 V, complete with a slate-panel switchboard and battery.

Wolseley Sheep Shearing Co., Ltd.

This firm also has a small electric power plant among its exhibits. This is a 2-kW set in which an oil engine running at low speed drives a generator through stepping-up gears which are totally enclosed. The engine has a detachable cylinder head and forced lubrication. Another exhibit to be seen on this stand is an electrically-operated sheep-shearing equipment, consisting of a small motor driving clippers through a flexible shaft at the rate of 2,500 r.p.m.

Howden-Ljungström Air Preheaters (Land), Ltd.

An example of this firm's air preheater, which has been described in the ELEC. REV. (August 10th, 1923), is shown on its stand. This is designed to take the place of the economiser in boiler installations, using the waste gases to heat the air prior to its being supplied to the furnaces. It is claimed for the equipment that it reduces fuel costs by 25 per cent., and is particularly successful in cases where low-grade fuel is in use. Actual comparative tests carried out at the Willesden station of the North Metropolitan E.P.S. Co., Ltd., showed that a saving of 11.8 per cent. was effected in the fuel consumption by the use of the preheater, and the boiler efficiency was raised from 77.7 to 88.1 per cent.

Mr. J. Dyson.

A number of handsome cabinet receiving sets of the four-valve pattern are displayed upon this stand, all of which employ the "Airmax" inductance coil. This consists of bare copper wire wound on a specially-designed ebonite former giving a considerable air space between adjacent turns. Another device shown is a new type of earth cone. This is of substantial proportions, consisting of a cone of perforated zinc sheet filled with coke. It is claimed that two or three of these used in combination form an excellent earth.

(To be concluded.)

Correspondence.

Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Lead-covered Wiring and Visible Bonding.

It is not my wish to open a controversy over the merits or demerits of the above system of wiring, but I think it will be generally agreed that there is room—and necessity—for vast improvements, not in the cable itself, but with regard to the accessories.

The junction boxes at present manufactured are far too small to allow of a sound joint being made within or the insertion of a porcelain connector; it surely is not beyond the wit of the manufacturers to devise a box with fixed porcelain or vulcanite connector which would obviate the scamped work which too often occurs when lead-covered wiring is used.

G. T. C.

February 16th, 1925.

There are several systems of flat metal-sheathed surface wiring which come under the above heading, the difference between them being in the design of the bonding and connecting boxes.

The best of them, in my opinion, is undoubtedly "The Wall-Kal system," brought forward by the Walsall Hardware Manufacturing Co., due to the fact that their bonding boxes are substantial and the metal covers can be removed for inspection without breaking the continuity of the metal sheathing, this (which is most necessary) being an excellent fit in the bonding boxes, nipples, &c.

In addition to the above, when bonding boxes and metal adaptor rings are installed instead of wooden blocks for switch and ceiling rose fixing, one has as good a job as possible in metal-sheathed wiring, the wires being totally enclosed throughout, and not resting against damp walls, &c., as is possible where wooden blocks are used to fix switches and brackets. One is apt, when installing metal-sheathed wiring systems, not to pay sufficient attention to the lay-out of the work, also not to place the fixing saddles close enough to prevent sag, and in roof work sufficient consideration is not given to keeping the run as far as possible from anyone damaging the wiring.

J. T. Brown.

Ruthin, *February 16th*, 1925.

With reference to "Electron's" letter of the 6th instant re "Bonding Clips for Lead-covered Cables," it may interest him to know that a very efficient clip of this type is manufactured by the Electric Elements Co., of Nottingham. I have found these very satisfactory.

Engineer.

February 16th, 1925.

We have noted the remarks of your correspondent "Enthusiast" under the above heading, and may say that it was "the nastly flimsy gadgets" generally used for bonding which caused us to evolve our range of solid malleable iron fittings.

There are no loose parts, only the turn of a screw to complete the job. When the cable is clamped it can easily be seen that the sheathing and the interior of the fitting are in permanent surface contact for approximately ¼ sq. in. with the smallest cable, oxidisation between them being impossible.

The metal covering cannot "creep" in the grip which covers 11/12ths of the sheathing surface, although ample tolerance is present in the grip before tightening up.

Nipples are supplied for bonding cables to ironclad gear (twin 1/.044 to 19/.052).

We should be pleased to send details and samples to your correspondent.

The Walsall Hardware Manufacturing Co., Ltd.
C. F. MAISEY, *London Manager.*

London, *February 23rd*, 1925.

The Resistance of Aerials.

I see in your issue of January 30th, page 185, a report by Mr. Turner on measurements of oxidised wires to ascertain the variation in resistance (if any) caused by weathering.

It appears that oxidation produces no sensible increase in resistance to the passage of a small current, such as that in a wireless aerial. This reminds me that less than two years ago, while engaged in the wireless business, I found that this same oxidation was being blamed for weak reception. The explanation given by salesmen and technical staffs was that the alternating current travelled on the outer surface of the wire.

Whether this was to push the sale of enamelled wire I do not know, but as much of the bad reception I found was

caused through faulty earth connections, it only goes to show what technical rubbish is sometimes dished out to the unsuspecting public, to the eventual detriment of our industry.

J. M. Buckner.

London, *February 15th*, 1925.

P.S.—I see that according to the daily Press at least three fires already this year are "believed to have been caused by the fusing of an electric wire."

Bankruptcy Reform.

Referring to your issue of last week and to your report on the outcome of the Board of Trade Committee's deliberations *re* bankruptcies, there is one point that seems to me possible and helpful in the tightening up of the existing bankruptcy code.

Every limited company has to register and advertise debentures under the present regulations—would it not be possible to enact that every limited company would have to announce annually by advertisement whether its balance sheet showed a loss or a profit?

It seems to me that if this were possible, firms dealing with such limited companies would be able to regulate their credits, and consequently many firms would not get the abnormal credits they are at present enjoying; and if they were not fit to be in business on their own, they would soon find themselves out of business, to the benefit of the country as a whole.

G. S. Williams,
"Z" Electric Lamp & Supplies Co., Ltd.

Liverpool, *February 17th*, 1925.

Mr. Oliver Heaviside.

It seems astounding that the passing of such a man as Mr. Oliver Heaviside should take up so little space in the technical Press in our enlightened age—the electrical age—and after he had done so much!

Thanks.

[We do not maintain a sliding scale of space and achievement. Mr. Heaviside accomplished a great work, which remains his monument for ever; but little was known of him as a man, owing to his living in seclusion. Was any material fact omitted from our obituary notice?—EDS. ELEC. REV.]

High-pressure Cables.

In the paper of mine, read before the Junior Institution of Engineers, which you were good enough to publish in abstract in your issue of the 23rd ultimo, there was an omission to summarise the results arrived at—which was only partially compensated for by the lantern slide No. 11 exhibited at the lecture, and which would have called attention to the following points:—

(1) The adaptability of my present proposals to any ordinary overhead 3-phase line, without any modification whatever of the latter.
(2) The fact that these proposals only involve the use of three cables instead of *six* cables.
(3) That they only involve the use of a plain 3-phase grouping of transformers, and hence the previous charges of undue "complexity" (no matter how unjustified) no longer obtain.
(4) That the effect of raising the voltage on 3-core cables of standard type is only to diminish the current-carrying capacity of a given cable, while considerably increasing its diameter and the number of joints per mile.
(5) That it is uncommercial to carry the voltage of 3-core cables of standard form much above 66,000 volts, and that at this voltage they are unsuitable for linking up with overhead lines for really long transmissions.
(6) That it is uncommercial, if not impracticable, to carry the voltage of ordinary single-core cable systems (such as that at Gennevilliers) above 100,000 volts.
(7) That the advantages, both in cost of copper and in regulation, are manifestly so much greater at 150,000 volts (when large powers have to be transmitted) that it becomes uncommercial to operate at 100,000 volts, provided a cable can be made to operate at 150,000 volts.
(8) The cable which I am proposing has been tested up to the equivalent (across outers) of 725,000 volts at 50 periods, and the lessons learnt in manufacture and test open up the possibility of improving even this result.

On one of these points (4) I would like to put my remarks into a somewhat more concrete form.

From the calculations given in the appendices of this paper it can be shown that, to transmit equal power, under equal thermal gradients and potential gradients, approximately *eight* 66,000-volt, 3-core (Paris) cables, each 4¼ in. in diameter, are required to do the work of *three* triple-concentric cables, each 3 in. in diameter, the eight cables carrying eight times as much copper and 4¼ (to 5) times as much lead as the three triple-concentric cables.

Moreover, if, in order to reduce the considerable amount of room required under the pavement for the eight cables, these are "nested," instead of being laid out flat at 1-ft. 6-in. centres, it will then be necessary to have, say, 11 cables of 66,000-volt type; representing 11 times the copper, and, say, six times the lead, that are required with the triple-concentric cable.

In the overhead part of the line, which may be of great length, the above waste of copper will still apply, and is very serious. Moreover, the regulation of the overhead line itself will be 6½ times as bad with the 66,000-volt underground cable as with the 150,000-volt cable.

The reason why I have confined the above remarks to the consideration of only 66,000-volt cables rather than, for example, three single-core 100,000-volt cables, is that, as far as I can judge, the cable makers of this country at the present moment would rather put forward a 66,000-volt, 3-core cable than three single-core, 100,000-volt cables. I enclose a copy of the J.I.E. *Journal* for February, 1925.

A. M. Taylor,
Major, S.O.2.

Birmingham, *February 16th*, 1925.

Bell Transformers.

I should like to hear the opinion of your readers respecting small transformers as used in connection with electric bells for private houses, &c.

Should supply companies make a separate charge for exciting bell transformers when the current has already passed through a meter?

Fairplay.

February 21st, 1925.

The Training of Engineers.

I was much interested in Mr. J. W. Thomas's article on the training of engineers for the electricity supply industry.

I sincerely hope, however, that those poor unfortunates—after doing their seven years and just finding their financial feet—will not have to join the I.E.E. By all means let them pass an equivalent examination, but I think it would be extremely hard on them to have to "stump up" for another society or institution as well as for the E.P.E.A.

Even semi-hardened cases like myself have inclinations to throw fits when the New Year comes round and those well-known envelopes start dribbling in!

W.

February 21st, 1925.

The Heating of Lampholder Adaptors.

In your issue of February 13th, you published an interesting article on some experiments with the heating of plunger-type lampholders.

It may be of general interest to mention some results of tests I carried out with my new type of adaptor which has the adaptor contacts arranged on an inclined plane, thus forcing the lampholder plungers against their housing when the adaptor is put in place.

I used one of these for considerable periods with a loading of 8.5 amperes without appreciable heating. I then put one in series with an ordinary adaptor with flat contacts and applied the same current, but it was not long before this broke down, as the springs in the lampholder apparently carried most of the current, and consequently got hot and lost their temper, while the new pattern adaptor stood up all right.

I do not suggest that currents as high as this should be carried by adaptors, but I agree with Mr. L. G. H. Sarsfield that a large number of domestic articles would be more popular if they could be used without fitting special sockets.

J. H. Collie.
J. H. COLLIE & Co.

Liverpool, *February 20th*, 1925.

The Cost of Rural Distribution in France.—In a report upon electrical developments in France reproduced in *Commerce Reports*, Mr. D. C. Woods, the American Consul in Paris, states that, according to calculations by La Meridionale of Carcassone, which has electrified a large portion of the farming region in the Aude, the electrical installations will cost 1,000 fr. for each isolated farm and 250 fr. for each inhabitant of a hamlet. It is estimated that 25,000,000 fr. must be expended in erecting a central plant capable of producing 10,000 kW. If the surrounding region is semi-agricultural and semi-industrial, 50,000,000 fr. must be spent on the construction of the distributing system. In order, therefore, to distribute 10,000 kW of electricity under normal rural conditions, one must employ a capital of at least 80,000,000 fr. The large capital required subjects the organisers to the necessity of creating agencies under cantonal forms for the economical production, transmission, transformation, and wholesale delivery of the electricity. Special associations in the community centres will be entrusted with the retail distribution. It is generally considered that the availability of electricity throughout the French rural areas will be an important factor in increasing the agricultural production; it should improve the conditions of country life, lessen the cost of labour, increase the number of small factories, minimise high rentals by dispersing the population, discourage an exodus of country people to the cities and bring about the return of many to the land.

Business Notes.

Bankruptcy Proceedings.—HYMAN WEINER, trading as Harry G. Weiner & Co., 112, Wellington Street, Leicester, wholesale merchant.—The first meeting of the creditors was held on February 13th at the Official Receiver's office, Leicester. It appeared that debtor formerly dealt in second-hand machinery, &c., at Wilkes Street, London. In November, 1923, he went to Leicester, and in July, 1924, secured a lease of the Wellington Street premises. He then set machinery in motion to obtain goods, mostly in the wireless trade, on credit on a big scale. With this object in view he appeared to have circularised the whole country for price lists and samples. In most instances he paid for the samples received. Goods in bulk appear to have been sent to the Wellington Street premises in November on credit terms 2½ per cent. monthly, and during the following three months these credit purchases had amounted to upwards of £10,000 from about 150 houses. The statement of affairs had not yet been lodged, but at his preliminary examination the debtor stated that his assets were represented by the amount of £10,264 owing to his estate by a firm in London and the remaining stock at the Wellington Street premises valued at £2,500. It was stated that this stock would not realise nearly that sum. Debtor attributed his failure to non-payment by the firm mentioned in accordance with terms. The creditors resolved to appoint Mr. C. T. Appleby, of 26, Corporation Street, Birmingham, C.A., as trustee of the estate, while a committee of inspection was also nominated. The following are among the creditors:—

	£		£
Spiers & Baker, Ltd.	71	Mullard Radio Valve Co. Ltd....	125
Ashdown, H. E. (Birmingham). Ltd.	99	Fellows Magneto Co., Ltd. ...	213
Dick, R. & J., Ltd.	64	Wallis, Jos., & Son, Ltd. ...	52
Reynolds & Bradwell	103	Electrical Supplies Co.	83
Spears & Co.	27	Darag (London), Ltd.	45
Baynton's Wholesale Wireless, Ltd.	44	M.E.L., Ltd.	294
Tofield, H. C., Ltd.	65	British L.M. Ericsson Mfg. Co. Ltd.	215
Lloyd, Richard, & Co., Ltd. ...	30	Etablissements Hutchinson ...	91
Tele-Radio Co.	47	Brown Bros., Ltd.	85
Cooke & Whitfield Wireless, Ltd.	39	Hambling, Clapp & Co., Ltd. ...	98
Mason & Co.	57	Field, Stanley	51
Fell, George & Son, Ltd. ...	61	Lugton & Co., Ltd....	23
Appleyard, J., & Co.	47	Chrussachi, G. M.	111
Sullivan, H. W., Ltd.	102	Cole Henry A., & Co., Ltd. ...	52
Brown, S. G., Ltd.	232	Cullen, J. W., Ltd.	30
Formo Co.	170	Foulds, I., & Son	113
Wireless Instrument Mfg. Co.	33	Morley, T. B., & Co. Ltd. ...	47
Lowenadler, F. W.	97	London & Provincial Radio Co., Ltd.	420
Houghtons, Ltd.	135	Ashley Wireless Telephone Co....	198
Davenport, G. (Wireless), Ltd....	269	South Wales Wireless Installation Co., Ltd.	136
Swedish General Electric Ltd. ...	72	Capel, P.	31
Stockall, Marples & Co. (1912), Ltd.	81	Premier Accumulator Co. (1921), Ltd.	154
London Electric Wire Co. & Smiths. Ltd.	138	Samuel Yarwood & Son Ltd. ...	70
Smith, Douglas & Co.	21	Master Radio Mfg. Co.	37
Hills & Johnson	36	Manchester Radio Co., Ltd. ...	22
Ellis & Sons (1923), Ltd.	61	Lewtas, H., & Co.	78
Hydleman, L. J., & Co.	182	Liddington, H. L.	31
Nelson Valve Co.	32	Fleming, Birkby & Goodall, Ltd.	127
Rothermel, R. A., Ltd.	87	Burnett Motor Tyre & Rubber Co.	105
Max Berci	319	Scroggie Bros.	88
"Z" Electric Lamp & Supplies Co., Ltd.	45	Henderson H., & Sons	31
Pritchett & Gold & E.P.S. Co., Ltd.	163	Dent & Co. & Johnson, Ltd. ...	148
Dew, A. J., & Co.	93	Radio Experts, Ltd.	85
McMichael, L., Ltd.	77	King & Harper	58
Behm, A. (London), Ltd.	79	Richardson, W. & J.	57
Patton, David J., Ltd.	130	Wallis, H. O., & Co.	24
Henley's, W. T., Telegraph Works Co., Ltd.	25	Radions, Ltd.	43
Stichling, R.	41	Wadsworth, H., Sellers & Co.	69
		Doughty, F. W.	69
		Hirst, John L., & Sons, Ltd. ...	42

HARRY DAVID ZEALANDER (trading as S. Davis & Company), 226, Bishopsgate, E.C., electric lamp dealer.—An application for an order of discharge was made on February 17th to Mr. Registrar Mellor, at the London Bankruptcy Court, on behalf of this bankrupt, who was brought to the Court last October on the petition of the British Thomson-Houston Co., Ltd., creditors for £70 under judgments obtained in respect of patent infringements. The Official Receiver (Mr. V. Armstrong) reported that there were no other liabilities and no assets had been disclosed or realised. After hearing Mr. Stainton for the petitioning creditors and Mr. Garnett for the bankrupt, Mr. Registrar Mellor granted a discharge subject to a minimum suspension of two years.

A. E. MARTIN, electrical engineer, 17, Maud Street, Higher Broughton, and 104, Oldham Road, Manchester.—First meeting, February 24th, at the Official Receiver's office, Byrom Street, Manchester. Public examination, March 6th, at the Court House, Manchester.

M. O. HECKELS, electrical wholesaler and agent, 643, Welbeck Road, and Star Buildings, Northumberland Street, Newcastle-on-Tyne.—Discharged subject to consenting to judgment for £100 being entered against him and paying 30s. costs of judgment (£100 paid to the Official Receiver in *lieu* of entering up judgment).

W. M. HORSFALL, electrical engineer, Heath Lodge, Hooton, and 7, Redcross Street, Liverpool.—First dividend of 3½d. in the £, payable March 6th, at the offices of the Official Receiver, 11, Dale Street, Liverpool.

H. C. PERRY, building and electrical contractor, 206, Mount Pleasant, and Birchfield Road, Headley Cross, Redditch.—First and final dividend of 4s. 1½d. in the £, payable at the Official Receiver's office, 191, Corporation Street, Birmingham.

MAJOR DODGSON, Railway Station Yard, Bridlington, Yorks., plumber and electrician.—The receiving order in this matter was made on February 5th on debtor's own petition. The statement of affairs shows liabilities of £717, while the assets are estimated at £177, from which preferential claims of £32 have to be deducted, leaving net assets of £146, or a deficiency of £571. Debtor attributes his failure to losses on contracts through depreciation of stock and increased cost of labour and lack of capital. Debtor stated that for the first three months of his trading he made a living, but since then the profits had been insufficient to meet the working expenses.

G. H. DIXON, 46, Market Place, Dewsbury, Yorks., electrical contractor.—The first meeting of the creditors was held on February 17th, at the County Court House, Dewsbury. The statement of affairs showed gross liabilities of £267, of which £226 was expected to rank, with a deficiency of £165. Debtor attributed his failure to lack of capital.

L. BACKHOUSE, C. H. THORNTON & S. EVANS (Arc Electrical Co.), electrical and wireless suppliers, Palatine Buildings, Victoria Street, Manchester.—Second and final dividend of 14s. 6d. in the £ and 4 per cent. interest, payable February 27th, at the office of the Trustee, Mr. A. T. Eaves, 15, Fountain Street, Manchester.

T. TWIST (T. Twist & Son), electrical engineer and contractor, 20, Carnegie Street, and George Street, St. Helens.—First meeting, March 3rd, at the offices of the Official Receiver, 11, Dale Street, Liverpool. Public examination, March 24th, at the Court House, Liverpool.

R. HAMMOND, electrical engineer, 3, The Arcade, Richmond.—Application for discharge to be heard March 23rd, at the Court House, Wandsworth.

L. N. STRIBLING and A. E. SETTERFIELD (Stribling & Setterfield), electrical engineers, 17, Market Place, Margate.—First and final dividend of 1s. 4½d. in the £, payable February 28th, at the Official Receiver's office, 10, Burgate Street, Canterbury.

Company Liquidations.—THE B.E. COMPANY (OF LONDON AND BIRMINGHAM), LTD.—Mr. F. Rowland, the liquidator in this voluntary winding up, reports that the liquidation has proved more satisfactory than was anticipated. The stock was offered for sale by public tender, but the result was disappointing and eventually it was disposed of through various channels for a good figure. 92 per cent. of the trade debts were recovered. The ordinary share calls were collected in full, but in the case of the preference shares a compromise was agreed with the sanction of an Order of the Court. The receipts were estimated to realise £5,980, but they actually realised £4,495. After deducting expenses of realisation £809, legal expenses £43, liquidator's expenses £97, and liquidator's remuneration £364, the preferential creditors (£395) were paid in full and dividends paid to creditors amounted to £2,786, being 5s. 4d. in the £ on claims amounting to £10,488.

BARCLAY'S RADIO STORES, LTD.—Meeting of creditors was called for February 23rd, at the offices of Messrs. Poppleton and Appleby, 26, Corporation Street, Birmingham. Particulars of claims to be sent to the Liquidator, Mr. C. T. Appleby, 26, Corporation Street, Birmingham, by March 20th.

FORD ELECTRICAL CO., LTD., 4a, Macdonald's Lane, Manchester, electrical engineers and contractors.—A meeting of creditors was held on February 17th, at Manchester, when Mr. J. F. Stott, I.A., Manchester, the liquidator of the company, occupied the chair. A statement of affairs as at January 30th, was presented, which showed liabilities of £3,208, of which £2,195 was due to unsecured creditors, and £1,013 to the bank. There were debentures for £1,017. The net assets were given as £593, leaving a deficiency of £2,615. The liquidator reported that in March, 1919, the concern was formed into a small limited company with a subscribed capital of £458, equally divided between the two partners. Later additional capital of £700 was provided. In 1923 the stock on branch premises was destroyed by fire and a considerable loss was sustained. The trading figures for the 13 months ended February, 1922, showed a loss of £34; for the 12 months ended February, 1923, the profit was £77; for the 12 months ended February, 1924, the profit was £111, and from February, 1924, to date there was a loss of £2,663. The company only paid one dividend in June, 1923, 5 per cent., which absorbed £46. The adverse balance on the balance sheet at February, 1924, amounted to £88 11s. 10d., and the whole of the deficiency as against the shareholders of £3,773 had apparently arisen since that date. Mr. Ford stated that since October last the company had taken on contracts for schools and other public places, and he attributed the whole of the losses to these contracts; £2,000 had been lost since October on that class of work. It was decided to confirm the appointment of Mr. Stott as liquidator, with a committee of inspection consisting of the representatives of the General Electric Co., Ltd., Messrs. R. O'Brien & Co. and Credenda Conduits, Ltd.

WEST LANCASHIRE ELECTRICAL CO., LTD., Southport, mechanical and electrical engineers.—A meeting of creditors was held on February 16th, at Southport. The Liquidator of the company, Mr. J. A. Bond, C.A., presented a statement of affairs which showed liabilities of £1,957, of which £1,438 was due to the trade. There was a bank overdraft of £399, which was guaranteed by the directors, and there was an amount of £120 due to a director for a balance of salary and advances made on the company's account. The assets were

estimated to realise £840, from which had to be deducted preferential claims amounting to £54, leaving net assets of £786, or a deficiency of £1,171. According to a deficiency account for the year to February 28th, 1922, there was a loss of £917; for the following year there was a loss of £76, and for the eleven months to January 30th, 1925, there was a loss of £1,653. A profit of £95 was made for the year ended February, 1921, and there was also a profit of £51 for the year ended February, 1923.

The company was incorporated on January 31st, 1920, with a nominal capital of £2,000, for the purpose of carrying on business as mechanical and electrical engineers. The issued share capital of the company was £1,200, all of which had been subscribed in cash. The directors of the company had not been voted any remuneration, except the two managing directors, who had been paid a salary of £5 a week. It was decided to apply to the Court for the appointment of Mr. J. T. Warburton, of the Palatine Trade Protection Office, Manchester, as joint liquidator with Mr. J. A. Bond.

VIENNESE ELECTRIC LAMPWORKS.—Final general meeting at 174, High Street, Acton, W., March 28th. Liquidator: Mr. A. J. P. Coleman.

Dissolution of Partnership.—J. P. & T. R. ATKINS, electricians and electrical engineers, 70, South Circular Road, Dublin.—Messrs. J. P. & T. R. Atkins have dissolved partnership. Mr. T. R. Atkins will continue the business in his own name at the same address.

Private Arrangements.—F. R. HICKSON, 16, Dartmouth Park Hill, N.W.5, electrical engineer and radio dealer.—A meeting of the creditors was held on February 19th, at the offices of Messrs. Corfield & Cripwell. The statement of affairs presented showed liabilities of £471, of which £380 was due to unsecured trade creditors, and £91 to cash creditors. There were fully secured creditors for £26. The assets were valued at £130, from which had to be deducted £32 due to preferential creditors, leaving net assets of £98, or a deficiency of £373.

It was reported that the debtor started business in August, 1923. He had kept no proper books of account, but his average turnover was in the neighbourhood of £25 to £30 per week. The profit was about £8, and out of that the debtor had drawn between £6 and £7 a week for personal expenses. Several electrical contracts had been entered into, but Mr. Osborn reported that practically all those contracts were unremunerative. It was decided that a deed of assignment should be executed in favour of Mr. Osborn as trustee. The following are among the creditors:—

	£		£
Brown Bros., Ltd.	45	Houghtons, Ltd.	41
Falk, Stadelmann & Co.	35	Sun Electrical Co., Ltd.	53

Trade Announcements.—MR. A. TONGE, electrical engineer, Luton, Beds., has opened new premises at 8, Cardigan Street.

MESSRS. THANET ELECTRIC FACTORS, LTD., have started business as factors of electrical and wireless accessories, at Prospect Place, Broadstairs, and they wish to receive manufacturers' price lists.

Catalogues and Lists.—MESSRS. BETHEL PLAYER & CO., LTD., 17, Philpot Lane, E.C.3.—An illustrated catalogue of lapping machines.

THE B.E.N. PATENTS, LTD., 100, Victoria Street, S.W.1.—A descriptive catalogue of portable electric drills. Illustrated and priced.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—Special Publication No. 950, illustrating and describing the 1,000-kW La Cour motor converter.

MESSRS. HIGGS BROS., Witton, Birmingham.—A stock list of motors and dynamos ranging from .25 to 50 h.p.

GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Catalogue Sections F (2) containing illustrations and prices of electric lighting fittings and accessories; and F (3) dealing with plain and coloured glassware of a variety of types.

THE HYDRAULIC ENGINEERING CO., LTD., Chester.—A reproduction of an order from the Lancashire Electric Power Co. for a second "Mangnall-Irving" thrust borer.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—"Power House and Sub-stations Installation Leaflet No. 3," illustrating and describing the generating and converting plant, &c., at Blackpool.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—A poster announcing a reduction in the price of the company's headphones.

MR. J. A. BROOK, 84, Blackmoorfoot Road, Huddersfield.—Folder and other circulars relating to the "J.A.B." electric lamp lock.

MESSRS. SIMMONS & STOKES, LTD., 4, Vernon Place, Southampton Row, W.C.1.—A well-illustrated catalogue of couplings and plugs for electric cables ("Niphan" system). Fully priced.

THE FROME ENGINEERING CO., LTD., 8, Red Lion Square, W.C.1.—A series of illustrated and priced pamphlets dealing with the "Hobbs" internal-combustion engine and circular saws and accessories.

MESSRS. LESLIE DIXON & CO., 9, Colonial Avenue, Minories, E.1.—An illustrated catalogue and a price list of radio apparatus of all kinds.

VICKERS AND INTERNATIONAL COMBUSTION ENGINEERING, LTD., Africa House, Kingsway, W.C.2.—A pamphlet containing the opinions of prominent engineers on pulverised fuel firing, and another dealing with pulverised fuel for cement plant.

THE NEW ITALIAN ART ASSOCIATION, LTD., 38, Newman Street, W.1.—An illustrated and priced folder advertising "Perloray" and "Deco-lux" lighting fittings.

Fire.—A great deal of damage was caused by a fire which occurred last week at the electrical fittings factory of the Nico Light Co., Ltd., Birmingham.

A serious fire occurred recently at the Birmingham premises of the Perfection Electric Heaters. Three workshops were burnt out.

The Electrical Imports of Peru.—CORRECTION.—Since the statistics appearing on page 356 of this issue went to press, the following corrections have been received from the compiler:—The first of the three columns as usual relates to 1922, the second to 1923, and the third to increase or decrease. In the "Electrical Accessories" section for Great Britain read United States. In the "Accumulators and Batteries" section, for Germany read United States, and for United States read Great Britain. In the totals section, the sign § should appear against the figures 99,000.

Book Notices.—"Spectrum Analysis with Hilger Instruments." Pp. 23; 3 figs. London: Adam Hilger, Ltd. Price 9d. net.—This brief epitome of the technique of spectrum analysis, with particular reference to analysis by spectrography, commences with the apparatus, the various patterns of instrument recommended for different purposes being enumerated. A description of the means of exciting emission spectra is followed by a note on the various types of spectrum, for which the publishers are indebted to Prof. E. N. da C. Andrade, D.Sc., Ph.D., of the Artillery College, Woolwich. Next the taking of spectrograms, the measurement of wavelengths, and the identification of elements, are explained and the types of problem to which spectrum analysis is applicable are mentioned, quantitive spectroscopy being the final subject dealt with, and an appendix is devoted to the determination of wavelength by interpolation.

"Patents Invention and Method," by Harold E. Potts, M.Sc. Pp. 160 + vii. London: The Open Court Company. Price 3s. 6d. net.—The book consists of a series of papers published at intervals during the past twelve years, dealing with problems of patent law and some scientific considerations in connection with it. The author, who is an authority on patent law, details the three main problems by which he is attracted, *viz.*:—(1) The criterion of an invention; (2) The definition of an invention; (3) The evolution of an invention. He does not claim to have solved any of these problems, but suggests the scientific considerations in the papers as a help in that direction.

Publications of the United States Bureau of Standards.—Technologic Paper No. 267, "Effect of Hot-Rolling Conditions on the Physical Properties of a Carbon Steel"; and Scientific Paper No. 495, "A Radiometric Investigation of the Germicidal Action of Ultra-Violet Radiation."

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIV, No. 2. February, 1925. New York: The Institute. $1.

"Hooley's Confessions." By E. T. Hooley. Pp. xi+308; illustrated. London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd. Price 2s. 6d. net.

"Principles of Transmission in Telephony," by M. P. Weinbach. Pp. xiv+303; figs. 91. London: Macmillan and Co., Ltd. Price 17s. net.

Electrician Electrical Trades Directory and Handbook, 1924. London: Benn Bros., Ltd. Price 25s. net.

The Trade Facilities Bill.—The Trade Facilities Acts, 1921-24, authorised the Treasury, after consultation with the Advisory Committee appointed thereunder, to guarantee the payment of the interest and/or principal of loans to be applied towards the carrying out of capital undertakings or in the purchase of articles manufactured in the United Kingdom required for the purposes of any such undertakings. The aggregate capital amount of the loans the principal or interest of which may be guaranteed under the Acts is £65,000,000, and the period during which guarantees may be given will expire on March 31st. A Treasury memorandum states that it is estimated that at this date, authority for £7,000,000 of guarantees will be unused. It is proposed to extend the period during which guarantees may be given to March 31st, 1926. It is further proposed to increase the total of £65,000,000 to £70,000,000.

New French Companies.—A new company has recently been formed in Paris (120, Rue d'Assas), with a capital of 100,000 fr. and the title La Compagnie Hydro-Electrique d'Aix-les-Thermes, to establish a plant to utilise the water power of the Rivers Oriege and Lauze, in the South of France.

The Société Française des Machines Electriques Auto-réglable has been embodied with a capital of 5,000,000 fr., to work in France and her Colonies the Doloukhanoff patents for automatic electrical installations and other financial and commercial objects.

The Forces Motrices de l'Aigoual has been formed for the production and distribution of electricity and the construction and working of railway, tramway and other undertakings. The offices are at 245, Rue St. Honoré, Paris. Capital, 2,250,000 fr., increasable later to 6,000,000 fr. A portion of the capital is to be devoted to the acquisition of several variable concessions.

Egyptian Electrical Imports.—During the first nine months of 1924 the value of electrical machinery imported into Egypt was £102,256, as compared with about £80,000 for the equivalent period of 1923. France was the principal supplier, the United Kingdom occupying the third place.

F

New Zealand and Alleged "Ring."—The Christchurch (N.Z.) correspondent of the *Daily Mail* says that complaints are being made that a combination of English manufacturers is unfairly increasing the prices of electrical goods to New Zealand, and thereby seriously hampering hydro-electric development. Sir Francis Bell, the Attorney-General, declares that if such a combination exists the Government will use every legal means to defeat it.

Australian Industrial Development.—A correspondent of the *Financial Times*, writing upon the rapid development of Australian manufacturing industries, cites the case of the English Electric Co. of Australia. This company has been given a contract by the Public Works Department of New South Wales to make in Australia eight 66,000-V power transformers for use in long distance transmission. These transformers will constitute a record in Australian design and manufacture, handling electrical pressures far higher than any that have been made there before. The order was secured in competition with manufacturers from all parts of the world.

A Gas Company's View.—Speaking at the annual meeting of the shareholders of the Liverpool Gas Co., the chairman, Mr. H. Wade Deacon, said that the severe competition they had had to meet from electrical undertakings in the district became keener each year, and it was with extreme reluctance that they faced the necessity for an increase in the price of gas. The Government was talking about establishing electricity works all over the country out of public money. The company would have to watch such proceedings very carefully and take steps to safeguard its interests.

French Electrical Exports.—The export trade of the French electrical manufacturing industry, expressed in terms of francs, experienced a further development last year. In 1921 the franc value of the exports amounted to 211 millions, or 48 millions in excess of the corresponding imports. The value of the exports in 1922 was also 211 millions, thus surpassing the imports by 93 millions, while in 1923 the exports at 237 millions were higher by 80 millions than the imports of 157 millions. The distance between the two branches of trade was further extended last year, seeing that the exports are returned at 393 millions as compared with imports of 180 millions, or an export balance of 213 millions of francs. The figures certainly show remarkable progress, but the large import total indicates that, statements made in the French newspapers notwithstanding, the French electrical industry is still far from being able fully to satisfy the home market.

Lead. — Reporting on February 21st, Messrs. James Forster & Co. stated that supplies were plentiful and there was no lack of prompt lead. The Board of Trade returns for January were:—Imports, 21,653 tons; exports, 1,089 tons; left for home absorption, 20,564 tons. Reports of scarcity in the States have been somewhat exaggerated if not entirely untrue. "In the last two months, consumption both in the electrical and the domestic trades has fallen decidedly, and as supplies continue to come in freely, it must be assumed that the constant ups and downs on the market are purely of a professional character."

Sports.—Football and Badminton.—We understand that St. Helens Cable and Rubber Co., and Callenders Cable Co., who are keen rivals in the sports field, were opposing teams in the first round for the Cable Makers' Football Cup, Callenders making an easy win of 6—0. This was a resumption of the traditional competition between the companies, the St. Helens team, before leaving Warrington for Slough, playing Callender's Anchor Works at Leigh in sports of many kinds. A few days ago the tables were turned in a Badminton match between the teams of these firms, the St. Helens team winning by 13 events to 3. The St. Helens Cable Co. team, which includes as many of the heads of departments as possible, challenges any other electrical company or undertaking Badminton team in the United Kingdom.

Installation Contracts.—Among the recent contracts secured by Mr. H. Moss, Bradford, are the following:—Lighting and bell installations at Whittington Hall, Kirkby, Lonsdale, as well as the overhead and underground cables for the supply to this country seat; the electrical equipment of a large bakery at Morecambe; the lighting of the Eccleshill Wesleyan Schools; shop lighting for Messrs. Barratts, Ltd., Bradford; the lighting of the Glico Petroleum Works, Bradford, &c.

New Zealand Tariff Change Postponed.—The New Zealand Government has decided to postpone from April 1st to October 1st, the date upon which the new basis for preferential tariffs will come into operation. This refers to the alteration of the proportion of British material and labour necessary to secure preferential treatment from 25 to 75 per cent. Representations are being made to the Government to increase the proportion to 50 per cent. only.

The Lyons Spring Fair.—We are informed by the British representative that 139 stands are being arranged in the Electricity and Electrical Supplies section of the Lyons Fair, which opens on March 2nd.

A Japanese Failure.—The *Daily Telegraph* correspondent at Tokyo refers to the failure of the Takata Company, one of the oldest and one which "was believed to be one of the strongest" commercial houses. He says that the long-threatened announcement of its liquidation has not caught the general market unprepared; nevertheless, it came as a shock to the uninformed. Arrangements have already been completed for a new organisation, which will continue to care for foreign agencies and outstanding contracts. Among the agencies the most prominent is the Westinghouse, for which the Takata Company has done large business. The reasons for the failure are given as losses in the earthquake and fire and the subsequent general depression of business.

Australian Preferential Tariffs.—It is reported that the date upon which the alteration of the basis for the securing of the British preference (*i.e.*, from 25 to 75 per cent. British labour and materials) will come into force, has been slightly modified. Instead of applying to goods imported as from April 1st, the alteration will cover goods *invoiced* from Great Britain on and after that date. Goods which are not commercially produced in Australia may be admitted at the preferential rate if they represent not less than 25 per cent. British labour and materials, but the final process in all cases must have taken place in the United Kingdom and the goods have been dispatched direct to Australia.

The Question of Discounts.—In the course of an editorial the *Electrical World* says:—"There is nothing more greatly to be desired than that the electrical retailer should prosper. The manufacturer and the jobber of appliances and accessories that are sold to the public both realise that the lack of an adequate number of well-kept retail stores run by clever, able, active merchants who create a local market by all the artifices of modern merchandising, is a serious obstacle to the rapid development of household demand. The reason why the electrical industry develops this type of electric shop so slowly is because the electrical dealer has not made enough money in most cases to attract large numbers of expert merchants to this field. And one of the reasons why the dealer finds it hard to make money is because the million men and women now employed in the electrical industry are sucking the blood out of the retail trade by demanding 'courtesy discounts' on everything they buy for themselves or for their friends."

The Trade Press Forms Industrial Opinion.—Secretary Hoover sent a letter, describing the influence of the Trade Press, to the president of the McGraw Hill organisation and it was read at a big three-days' conference of representatives of that organisation held at the end of January in New York. In the course of the communication (which appears in the *Electrical World*) he said:—"A big change has come in the spirit of American business, and for this change you are in part responsible. I mean the change from rule-of-thumb and *laissez faire* to scientific determination of facts and programme of action based on facts. The business Press is probably the greatest force in making industrial opinion. The schools and colleges have an important place; the trade associations can do much in the fields of production and distribution; the government bureaus which keep in contact with business can help to promote sound leadership in industrial and economic thinking—all have an important place, but the business Press and technical journals are in a unique position and have a unique opportunity."

New Municipal Showrooms and Offices.—The Electricity Committee of the Swansea Corporation has decided to obtain a lease of the Carlton Restaurant in Oxford Street for use as showrooms and offices.

The Outlook in the United States.—The New York correspondent of *The Times Trade and Engineering Supplement* states that American financial authorities, manufacturers, exporters—even the Government—are thoroughly alive to what is ahead of them in the next few years as European production and competitive power recover. They are all preparing for much more formidable competition than American business has had to face in the past three or four years. Even so strongly entrenched an industry as steel manufacturing has already felt the inroads in the domestic field of foreign rail makers, and the cotton industry has long complained of the Lancashire goods which have scaled the tariff wall. While it is true that some manufacturers are looking mainly to the tariff to protect them, most are counting upon a reduction in their production costs to enable them to win in the coming struggle for markets. Very generally they share the view of the Secretary of Commerce, Mr. Hoover, who believes that after the next year or two their most difficult period will be over.

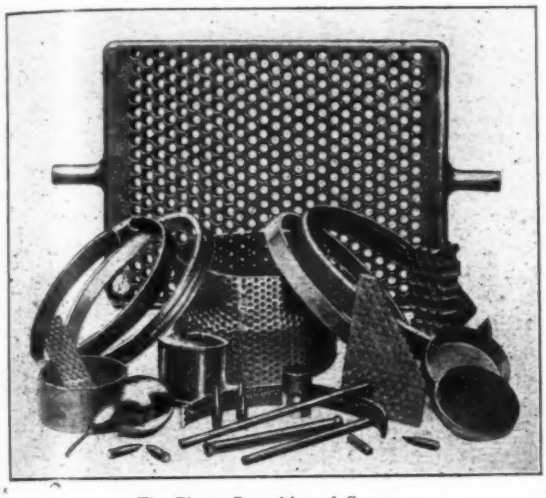
Callender's Band at 2LO.—Callender's Cable & Construction Co.'s Works Band, which won the Grand Shield at the National Band Festival at the Crystal Palace on September 27th, 1924, will be broadcast from 2LO from 7.30-10.30 p.m. this evening (Friday).

Copper and Lead Prices.—Messrs. F. Smith & Co. report, February 24th: Copper (electrolytic) bars, £70, 5s. dec.; ditto ditto sheets, no change; ditto ditto wire rods, £80, 5s. dec.; ditto ditto h.c. wire, 10d., 1/16d. dec.; Silicium bronze wire, 1s. 0¼d., ¼d. dec. Messrs. James & Shakespeare report, February 24th: Copper bars (best selected), sheet and rod, no change; English pig lead, £39 10s., 20s. inc.

Lift and Crane Makers' Association.—A general meeting of Lift, Hoist and Crane Makers will shortly be held under the auspices of the Council of this recently formed Association for the purpose of considering and approving rules, appointing officials, and for other important objects. All members of the trade who have not heard direct from the secretary should communicate with him, c/o Messrs. Hawkin Smalley & Co., 1, Mitre Court Buildings, Temple, E.C.4, which is the address of the Association. The date, place and agenda of the general trade meeting will be communicated to those wishing to attend if they make application to the secretary.

The Grenoble Exhibition.—A special British section is being organised in connection with the International Exhibition of Hydraulic Power and of Touring, which will be held in Grenoble from May to October this year, under the auspices of the French Government. Means of travelling, such as the latest electric locomotives, motor-cars, aeroplanes, seaplanes, &c., will also be among the exhibits. Among the foreign nations participating on a large scale are Norway and Sweden, who will exhibit in the hydraulic section. Germany will have on show many modern technical devices, and it is expected that Italy, Switzerland and Czecho-Slovakia will also take part.—*Reuter* (Paris).

The Electro-deposition of Copper.—The accompanying illustration shows a variety of electro-deposited articles recently produced by Mr. C. W. Denny, of 75, West Cromwell Road, S.W.5. Among the group will be noticed a seamless deposited radiator made in one solid piece, copper driving bands, carburetter floats, radiator tubes, detonator tubes, copper-clad bullets, and a few specimens of reinforced copper. The



The Electro-Deposition of Copper.

samples have all been produced in a copper-sulphate vat with an agitated solution. The copper is of a very close grain, extremely fine and ductile. There is also an example of "coppered fruit" (a copperplated pear), and the production of a copper box by electro-deposition. The electro-deposition of copper has very many industrial applications.

Wiring Practice in Egypt.—A recent issue of *Commerce Reports* contained an article on this subject by the United States Trade Commissioner at Alexandria. From this it is seen that the keynote of electrical installations in Egypt is cheapness, and in this respect German goods have an undoubted advantage. France supplies a small portion of the better-grade material, but British devices are said to be too expensive for common use by the large number of small Egyptian electrical contractors. Approximately 90 per cent. of the installations consist of twisted flexibles carried across walls and ceilings on small porcelain knobs. As the buildings are mainly of stone on concrete the risk of fire is not considered. The bayonet-type of lamp socket is in general use although Edison-screw sockets have been introduced in fittings from Germany and Czecho-Slovakia. The switches are principally of a cheap German rotary pattern, and most of the fuses (of the open link type) come from Germany. Higher-grade articles are handicapped by the absence of any sort of control or wiring regulations.

Annual Dinner.—The Hackbridge Cable Co. (Sports Club) is holding its annual dinner at the Duke's Head Hotel, Wallington, on March 7th.

For Sale.—Aberdare Urban District Council Electricity and Tramway Department invites offers for one 200-kW and one 100-kW, d.c. generating sets.

Darlington Corporation electricity department has for disposal a 220-cell storage battery.

Messrs. Veryard & Yates will offer by auction on Thursday, March 5th, at 31, Camden Street, Camden Town, quantities of ex-Government wireless, electrical, telephone, and general surplus stores.

Birmingham Electricity Supply Department invites offers for surplus steam generating plant and boilers, &c. (See our advertisement pages to-day.)

Electrical Trading Methods.—We are informed that a number of meetings have been held in Manchester during the last six months by the representatives of manufacturers, wholesalers and contractors, to consider improved trading methods. A report prepared by a sub-committee will shortly be placed before a general meeting, the date of which will be subsequently announced.

British Electrical Progress Abroad.—In the course of a report on the position of the engineering industry "A Correspondent" of *British Industries* (the organ of the F.B.I.) writes as follows on the electrical trade:—"It may be only a coincidence, but it is a remarkable fact that of late orders for British-made electrical cable have come from all parts of the world. The most considerable demands have come from Australia and South Africa, but Egypt and India have also placed orders. Railway electrification has taken another forward step in India, and a well-known British firm is supplying electrical railway plant on a large scale for an Indian system. In South Africa, also, the movement goes on rapidly, another large contract for the supply of railway electrical equipment to the Union Railways having been secured by a British firm in face of world-wide competition. Though small in itself, the installation of an automatic telephone system in Cairo by British engineers is significant of the great service the engineers of the United Kingdom continually render the Egyptian people. Another electrical engineering contract of considerable interest, is that placed for electric lift installations in the Government House (Viceroy's Palace) and Imperial Legislative Building at Delhi. This includes five passenger, three goods and seven service lifts for Government House, and six passenger, one goods and four service lifts for the Imperial Legislative Building."

In another part of the article the writer expresses doubt as to whether importers overseas fully appreciate the fact that the output capacity of the British engineering industry has increased very much since the war and that by increased demand the prices of the products of British engineers can be reduced. As a case in point he mentions that Clyde engineers and shipbuilders, because they are equipped with better tools and other improved means of production, are enabled to turn out more ships and engines with fewer workers. "If importers in different parts of the Empire take sufficient account of that fact, they will realise that, given a revival of business, British engineers can give better value than their competitors, if quality is taken into consideration as well as price."

The Palestine Electricity Concessions.—An *Exchange Telegraph* message from Amsterdam says that after three sessions Sir Douglas Hogg, K.C., Attorney-General, finished in the Hague Permanent Court of International Justice his pleadings in the case of the Mavromatis concessions in Palestine. He contended that the British Government had dispossessed Mavromatis of the concessions which he had received in 1914 from the Turkish Government for the construction of a tramway system, irrigation and electric lighting in Palestine, and also that the Zionist organisation should have prevented Mavromatis from executing the concessions. The British Government by granting concessions to Rutenberg in 1921 did not encroach on international obligations imposed on Great Britain by the Palestine mandate, as there was nothing in the Rutenberg concessions regarding the supply of electric power throughout Palestine to prevent Mavromatis from using the electric power provided for in his concessions. He concluded by emphasising that the policy of the British Government in Palestine was not incompatible with the recognition of any concession to Mavromatis, and he therefore urged the Court to reject the claim for compensation.

Water-Power Concessions in Spain.—In our last issue ("Lighting and Power Notes," p. 295) we recorded a decision of the Spanish Government to revoke all hydro-electric concessions granted before the Decree of June 14th, 1921, in cases where the *concessionaires* or their agents were not Spanish. The Department of Overseas Trade has now received a *résumé* of this order which may be examined by those interested.

Developments in Rumania.—The Bucharest correspondent of *The Times* reports that M. Constantinescu, Ministry of Industry and Commerce, has made an agreement with Messrs. Vickers, Ltd., in Paris, for the development of the metallurgical industry in Rumania. An aeroplane factory will be established in co-operation with Sir W. G. Armstrong, Whitworth & Co., Ltd. It is added that in Switzerland M. Constantinescu interested a group of financiers and electrical firms willing to co-operate in the development of hydro-electric power in Rumania. A Technical Mission composed of French, Italian and Swiss engineers is stated to be going to Rumania in March to make an extensive survey.

New Belgian Company.—A new company has lately been formed in Brussels with a capital of 6 million fr. and the title La Société de l'Electricité de la Meuse, to supply electricity for lighting and power purposes in the Meuse valley. The Société Générale Belge d'Entreprises Electriques, of Brussels, is interested in the new undertaking.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from February 18th:—

Accurect. No. 453,153. Class 8. Rectifiers and discharging tubes for use in telegraphy and telephony.—Naamlooze Venootschap Philips Gloeilampen Fabrieken, Eindhoven, Holland. (British representatives: Boult, Wade and Tennant, 112, Hatton Garden, E.C.1.)

Feraflex. No. 454,042. Class 8. Asbestos-covered electrical flexes.—Ward and Goldstone, Ltd., Manchester.

Dugdill's. No. 453,087. Class 13. Movable brackets for supporting electric lamps.—John Dugdill & Co., Hazel Grove, Stockport.

Jix. No. 455 251. Class 13. Electrical terminals and parts.—W. H. Bowling, 44, Dimond Street, Pembroke Dock.

Social Events. — The electrical staff of the Doncaster Collieries Association held a dinner and dance on February 14th, at the Danum Hotel, under the chairmanship of Mr. C. C. Bleach, A.M.I.E.E. About 70 sat down to dinner, which was given by the Chief Electrical Engineer, and 150 were present at the dance which followed.

The annual whist drive and dance of the Scottish Central Electric Power Co.'s operating staff took place at Larbert recently. Mrs. H. Brown, wife of the assistant manager, presented the whist prizes.

Metropolitan Electric Tramwaymen's Strike.—The strike of men employed in the repair shops of the Metropolitan Electric Tramways, at Hendon, which was temporarily settled about three weeks ago, was resumed on February 17th. It is stated that the strike is due to the dismissal of a shop steward, and the company's refusal to dismiss a foreman. An "unofficial" one-day strike of 20 motormen and conductors, in sympathy with the workshop men, occurred on February 21st. The company has offered to reinstate the dismissed shop steward, but declines to give notice to the foreman to whom the men object. The men's union considered that the company's terms were acceptable, but the men refused to return to work.

The men eventually returned to work on February 25th upon the company's terms.

Polish International Fair. — Particulars of the International Fair, which is to be held at Poznan (Posen), Poland, from May 3rd to 10th, have been received from the official British representatives, Messrs. Lambert and Krzysiac, Ltd., 40, Great Tower Street, E.C.3. Sections will be devoted to the electrotechnical industry and lighting, the metal industry, and building and engineering. Concurrently with the Fair the municipal authorities of Poznan are to hold an exhibition showing the requirements of the various cities of Poland. This will show the scope which exists for electrical plant, telephones, radio communication, &c.

Dance.—The Social Society of the County of London Electric Supply Co., Ltd., will hold a Carnival Dance to-morrow, Saturday, evening, at 7.30 o'clock, at Australia House, Strand, W.C. We have received a copy of No. 3 of *County Pie*, the Society's interesting official organ.

The B.I. Lamp.—Messrs. British Insulated & Helsby Cables, Ltd., inform us that it has been decided to change the name of the "British Union" lamp, which they manufacture in their lamp factory at Huyton Quarry, near Liverpool, to the "B.I." lamp, the new name being the first two initial letters of the cable company's title. The B.I. lamp will carry the firm's B.I. trade mark, which has hitherto characterised all the Helsby & Prescot products. Simultaneously with the change of name the prices of the lamp have been considerably reduced.

The Ex-British Westinghouse Association.—We understand that the seventh annual re-union of Ex-British Westinghouse men will be held at the Holborn Restaurant, on Friday, March 13th. Mr. Turnbull will occupy the chair. Invitations have already been broadcast, but should any ex-British Westinghouse man have been overlooked, he is requested to write to Mr. W. E. Warrilow, 40, Mildred Avenue, Watford.

To "Safeguard" British Headphone Business.—We are informed that Mr. F. Stacey Hooker, of C. A. Vandervell and Co., Ltd., is putting up in conjunction with other leaders of the wireless industry, a strenuous fight for the wireless business to rank as one of the protected industries under the Safeguarding Act. In stating his views in one of the financial papers, Mr. Hooker mentions only three of the numerous cases that have come under his notice, all in connection with headphones. In the first case a sample was submitted to him and 20,000 from London stock were offered at 4s. each; in the second case, a German manufacturer had already disposed of close on a quarter of a million at 3s. 3d.; and in the third case at 5s.. also in large bulk. Similar instruments of average British manufacture would cost at least four times the price. Mr. Hooker states emphatically that if some protection is not afforded quickly, the whole of the wireless supplies business in this country will pass into the hands of foreigners.

Employment During January.—The February *Ministry of Labour Gazette* states that while in the engineering industry generally employment continued bad, in the electrical branch it was still fairly good. The detailed statistics show that there was an increase of 0.3 per cent in the number of unemployed persons in the electrical engineering industry. In the electrical wiring and contracting branch there was an increase of 0.8 per cent.; in the electrical cable, wire, and electrical lamp manufacturing industry an increase of 1.4 per cent.; in the gas, water and electricity supply services an increase of 0.5 per cent.; and in the tramway and omnibus services an increase of 0.4 per cent. In all these instances, however, the percentage of unemployed persons is far below the general average, which is given as 11.3 per cent.

Radio Apparatus for Sweden.—The British Consul-General at Gothenburg (Mr. A. W. Woodhouse, C.B.E.), reports that a local firm carrying on a mail order business in a variety of goods, is desirous of getting into touch with United Kingdom manufacturers of crystal sets and headphones, and the cheaper lines of one- and two-valve receiving sets. Firms in a position to export British-made apparatus of the kind specified can obtain full particulars of the inquiry upon application to the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

New Italian Companies. — The Società Telefonica Tirrena has been formed at Leghorn, with a capital of 100,000 lire in 250-lire shares, increasable to 10,000,000 lire, to carry on wired and wireless telephone and telegraph business.

The Consortium Industriale per la Produzione de Energia Elettrica has been formed at Turin, with a capital of 1,500,000 lire. A feature of this trust is that it supplies its members with current in proportion to the amount of capital subscribed.

Lighting and Power Notes.

Barnes.—LOAN SANCTIONED.—The Urban District Council has received sanction to a loan of £3,000 for an additional supply of electricity to Messrs. Watney, Combe, Reid & Co., Ltd.

Bedford.—MAINS EXTENSIONS.—The Electricity Committee has recommended that mains be laid in Kempston at an estimated cost of £2,400, including the necessary transformers and kiosks.

Chichester.—EXTENSION OF SUPPLY.—The Town Council has decided to provide a supply of electricity to Selsey during the current year.

Colwyn Bay.—YEAR'S WORKING.—The statement of accounts of the Urban District Council's electricity undertaking, recently published, shows that the income during 1923-24 amounted to £21,166 and the expenditure to £16,940, leaving a net profit for the year of £4,226. The deficiency on the fund has now been cleared, and there is a surplus carried forward of £3,531.

Continental—GREECE.—The special Commission for the improvement of the lighting system in Athens is to ask the Government to assure sufficient lighting in stores and depôts during the winter months, and also to permit, without restriction, the installation of private electrical plant. There is at present a serious shortage of electrical energy.—*Commerce Reports.*

BELGIUM.—The Town Council of Gand has recently placed a contract for the construction of a power station which will cost 5,000,000 fr.

The Société Intercommunale Belge d'Electricité, of Brussels, has inaugurated its eighth generating station, at Bressow, which will raise the capacity of the company's stations to 107,400 kW. Other extensions are in hand which will increase the total capacity to 150,000 kW.

In consequence of the increasing demand for electricity, the Compagnie Electrique Anversoise is extending its distribution system in the Antwerp district. During the past year new h.p. lines were established to obtain supplies from the generating station of the Société d'Electricité de l'Escaut, an affiliated concern, a new transformer station was established in the Northern part of the city, additional plant was installed at the existing transformer station and the distribution network considerably extended. The Société d'Electricité de l'Escaut also reports an increasing demand, to meet which orders have been placed for additional turbo-generator sets and boilers for the central station at Merxem. The company is at present engaged in establishing mains for the supply of current to the villages along the left bank of the river Scheldt.

FRANCE.—Conferences have been held between the chief engineers of the Contrôle des Distributions d'Energie Electrique and those of the Géne rural to arrange the setting up of rural electric distribution networks in 21 townships in the Department of the Côte d'Or. Both the Compagnie Electrique de la Grosne and the Société Lyonnaise des Eaux et de l'Eclairage are in a position to supply the energy required, but the source of supply has not yet been decided. The estimated total outlay on the scheme is 455,000 fr. for the h.p. supply and 560,000 fr. for the l.p. supply.

Concessions for the supply of electricity in certain townships in the Department of the Isère have been secured by the Société Hydroélectrique de Fure et Morge et de Vizille, and construction in some cases has already been begun. Applications have also been made by the Société Générale de Force et Lumière and the Société des Forces Motrices du Vercors for concessions to supply in the department.

SWITZERLAND.—In the report for 1924 recently issued by the Swiss Electric Power Transmission Co., of Berne, it is stated that by means of its transformer stations at Rathausen and Gosgen, its distribution system is now connected up with all the principal electricity undertakings in German Switzerland. By means of the Rathausen plant, electricity can be obtained from the central stations of the Waggital, North-East Swiss, Central Swiss, the Lucerne-Engelburg, Olten-Aarburg and Berne generating stations and from the power plant of the Swiss Federal railway authorities at Amsteg. The Gosgen transformer station links up with the mains of the Berne, Laufenberg, Basel and North-East Swiss central stations.

Cranleigh.—ELECTRICITY SCHEME.—The local Gas Company, which proposes to provide an electricity supply for the district, has received satisfactory results from a canvass of prospective consumers, and the directors have submitted the matter to an electrical expert for a report. If the company does not install its own generating plant it will seek a bulk supply from Guildford.

Glasgow.—CHANGE-OVER.—The manager of the electricity undertaking has reported to the Electricity Committee that it is desirable to change over the system of supply in certain portions of the outlying area from d.c. to a.c. The Committee has approved the report.

Greasborough.—ELECTRICITY SCHEME.—The Urban District Council is to obtain information with regard to the laying of electric cables from Rotherham for thirty new houses and for street lighting.

Heywood.—LOANS.—The Electricity and Tramways Committee is applying for sanction to borrow £1,500 for extensions at Top-of-Heap, £1,500 for transformers, and £2,000 for mains and services.

India.—ELECTRICAL DEVELOPMENT.—*Indian Engineering* reports that the Madras Government has deputed a special officer to examine the possibilities of producing electricity for use in Malabar on the Wynaad Hills in the planting district. The officer has selected Vayitri as the most suitable place at which an artificial waterfall would be constructed by converging to a head some of the convenient waterways in the locality. The officer estimates an outlay of over Rs. 60 lakhs. The Government will undertake the work, and it is expected that the power station at Vayitri will be able to supply power for lighting and industrial purposes to the important towns in the district at low rates. Mr. Natisa Iyer, the official deputed, has recently concluded his inquiry.

In connection with the Kollimalais hydro-electric scheme, the Trichinopoly Electric Power Co., Ltd., is now engaged in the survey and demarcation of the necessary lands. The plans and schedules for the acquisition of land have been submitted to the revenue authorities, and it is hoped to install plant to generate over 4,000,000 kWh early next year.

Irish Free State.—LIFFEY INQUIRY.—The Irish Free State Joint Parliamentary Committee on the three Bills for the harnessing of the River Liffey for generating electricity, last week concluded its inquiry, and will shortly report as to which scheme it favours. Opposition to the Dublin Corporation Bill was withdrawn.

SHANNON SCHEME.—The Free State Minister of Commerce has announced the Government's decision to proceed with the Shannon hydro-electric scheme. The initial cost is estimated at £5,000,000, and the scheme will probably be financed by the Government by means of an American loan and carried out by Messrs. Siemens, of Berlin.

Leicestershire.—ELECTRICITY SCHEME.—Consent has been given by the Ministry of Transport to the erection of overhead lines for the transmission of electrical energy from Coalville to Syston by the Leicestershire and Warwickshire Electric Power Co. Opposition was made by several of the local Councils on the ground that the wires would be detrimental to the natural beauties of the Charnwood Forest, through which they would pass, but the Ministry, while overruling the objection, reserves power to review the situation at the end of five years.

London.—ST. PANCRAS.—The Electricity Committee has recommended that the present method of supply for lighting purposes under the small dwellings scheme to tenants of the Brookfield estate be abolished, that ordinary meters be installed, and the current charged for at an inclusive rate of 5½d. per kWh.

ISLINGTON.—The electrical engineer has submitted estimates of the cost of installing an additional generating set with accessories and linking up the power station with the stations of the St. Pancras and Hackney Borough Councils. Particulars of these estimates, which exceed £100,000, have been submitted to the Electricity Commissioners.

Northern Ireland.—LETTERKENNY (CO. DONEGAL).—The Urban Council has decided to ascertain the cost of a public electric lighting scheme.

LONDONDERRY.—The Corporation has made the following reductions in the charges for electricity for power purposes:—First 100 kWh per quarter, from 6d. to 4d. per kWh; all energy in excess of this amount, from 3d. to 2½d. per kWh. The meter rent has been restored to 3s. per meter per quarter.

New Zealand.—ELECTRICAL DEVELOPMENT.—The Waitomo Electric Power Board has reduced the amount of the proposed loan from £90,000 to £70,000, and a poll of ratepayers will shortly be taken. Of the amount to be raised £36,500 is required for transmission lines, sub-stations, and change-over at Te Kuiti, £13,500 for plant and reticulation, and £10,000 for extensions to lines.

The Franklin Electric Power Board, which was recently formed, is arranging to take a poll in connection with a loan of £200,000. Mr. J. R. Overton has been appointed electrical engineer.

Radcliffe.—PROPOSED HIRE OF DOMESTIC APPLIANCES.—The Electricity Committee has had under consideration a scheme for the sale and hire of appliances and accessories required for domestic purposes and, subject to the approval of the Higher Education Committee, it is proposed to conduct experiments at the domestic centre classes to determine the relative cost and efficiency of electricity and gas for cooking and other domestic purposes.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Horley and District Electric Supply Co., Ltd., to supply electricity in part of the Rural District of Reigate; and the transfer to the County of London Electric Supply Co., Ltd., of part of the undertaking of the South Metropolitan Electric Tramways and Lighting Co., Ltd., under the Chipstead and District Electric Lighting Order, 1915, for the supply in parts of the parish of Chipstead and the parish of Woodmansterne.

The Minister of Transport has confirmed the following Orders:—Portsmouth and Fareham Electricity (Bulk Supply) Special Order, 1924, Portsmouth and Chichester Electricity (Bulk Supply) Special Order, 1924, for the supply of electricity in bulk by Portsmouth to Fareham Urban District Council and Chichester Corporation respectively; Blackburn and Preston Electricity (Bulk Supply) Special Order, 1924, in respect of an agreement between the Blackburn and Preston Corporations to give mutual assistance, and to give and take bulk supplies.

Tewkesbury.—ELECTRICITY SUPPLY.—The Town Council has received notice of an application to be made by the West Gloucestershire Power Co., Ltd., for a Special Order, and the Town Clerk has been instructed to inquire of the company whether there will be any probability of the Council taking a supply of electricity in bulk when its mains are laid, and, if so, at what price.

Topsham (Devon). — PURCHASE OF UNDERTAKING. — The shareholders of the Topsham Electric Supply Co. have accepted an offer made by the Exeter City Council for the purchase of the undertaking. The purchase price is £2,059.

Tramway and Railway Notes.

Continental.—FRANCE.—The Conseil-Général of the Seine Department favours the proposed suspended railway for certain of the Paris suburbs. The line would run from one of the gates of Paris to Saint-Denis, rather less than three miles northward, but the promoters contemplate an eventual extension as far as Lille, and even Brussels. The cars, which are to be driven by an electrically-worked propeller, would run on a rail supported at an average height of 14 m. above the existing roadway. They would attain a speed of 50 m.p.h., and each carry 60 to 100 passengers, but no luggage. They would be built of aluminium and weigh five tons.—*Electric Railway and Tramway Journal.*

BELGIUM.—Plans have been passed by the Antwerp municipal and provincial authorities for the construction of a new electric tramway between the central station and the Dam station in Antwerp by the Société des Tramways d'Anvers.

RUSSIA.—The Moscow Town Railways has designed a new type of motor-driven tramcars for suburban traffic. The new cars will have four motors, and will be sufficiently powerful to draw two trailers. They will be placed in service during the autumn.—*Reuter's Trade Service* (Moscow).

ITALY.—During a discussion which took place recently in the Italian Parliament on the subject of railway electrification, it was announced that about 487 miles of railways in Italy had so far been electrified and that work was in hand for the conversion of the Pisa-Leghorn line, 12 miles; the Florence-Pistoia-Bologna line, 82 miles; the Florence-Faenza-Bologna line, 94 miles; the Rome-Sulmona line, 107 miles; the Rome-Garano-Nettuno line, 36 miles; the Benevento-Foggia line, 63 miles; the Genoa-Pisa line, 103 miles; and the Naples-Pozzuoli line, 8 miles; a total of about 500 miles. It was pointed out that in 1919 Parliament had given its approval for the electrification of 3,750 miles of railway, but that the carrying through of this large amount of work had been delayed from various causes.

Birmingham.—RATE RELIEF.—The Tramways Committee has agreed to increase its contribution to the borough fund by £13,000 to £40,000.

Brighton.—TRAMWAY EXTENSION.—In connection with the scheme for the extension of the Lewes Road tramway to the Moulscombe estate, the *Tramway and Railway World* reports that it is proposed to construct the extension on a private right-of-way. In a report on the subject, the engineer and manager (Mr. W. Marsh) states that a sleeper track would enable higher speeds to be attained than would be safe for a motor-'bus. The working costs would be less than in the case of tramways when the cost of maintenance of street paving had to be met, and less than the cost of a motor-omnibus service.

TRACK RENEWALS.—The Corporation is to renew the track from the station to North Road at an estimated cost of £3,750.

Glasgow.—RAILWAY ELECTRIFICATION.—The Corporation Health Committee has passed the following resolution:—"That, because of the amount of pollution in the air of the city caused by smoke from locomotives, the Corporation instruct the Committee on Parliamentary Bills to promote an Order in Parliament providing that within a certain number of years the railways within the city area be electrified, and that thereafter no steam locomotive be used in that area."

OMNIBUSES.—The Corporation has decided to suspend the "one-man" tramcar service between Argyle Street and Finniston Quay, and to run motor-omnibuses on the route for an experimental period of three months.

Halifax.—FARES.—The Tramways Committee has recommended to the Town Council that the tramway fares be reduced from 2d. to 1½d., and that the 1d. stages be extended from April 1st next.

Irish Free State.—DUBLIN.—The Free State Parliament has adopted the report of a Joint Committee approving of the Dublin United (Electric) Tramways (Omnibus Services) Bill, the object of which is to establish omnibus services connecting with the tramways at certain points and running to the more populous outlying districts in the Counties of Dublin, Kildare, &c.

Japan.—RAILWAY ELECTRIFICATION.—Good progress is being made with the electrification of the Tokaido railway between Tokyo and Odawara, and the construction of the transformer stations at Kawasaki and Higashi-Kanagawa is nearing completion. It is anticipated that the line will be completed for electrical operation by April next.

It is reported that the Government has decided not to continue with the scheme for the electrification of about 440 miles of its railway system, work on which was commenced recently.

London.—PROPOSED NEW TUBE.—A deputation waited on the Minister of Transport on February 18th to urge the need of greater railway facilities for South-East London. The deputation comprised members of Parliament and representatives of the boroughs of Bermondsey, Camberwell, Deptford, Greenwich, Lewisham, Southwark, and Woolwich. It was stated that the districts north of the Thames had 58 miles of underground railway serving 2¼ millions of people; the southern districts, with a population of nearly two millions, had only 11 miles, which chiefly served the south-west districts, leaving the south-east untouched. The deputation urged the Ministry to ascertain whether the Underground Electric Railways Co. would be prepared to extend its tube system to south-east London if satisfactory arrangements could be made for financial assistance under the Trade Facilities Acts. According to *The Times*, the Minister of Transport stated that he had already received a deputation from the East End, and had arranged to shortly receive one from the north-east districts. When he had done so, he proposed to consider the whole question, and afterwards remit the matter of the measures to be taken to the London Traffic Advisory Committee for consideration and report.

Walthamstow.—NEW TRACK.—The Urban District Council has decided to double the existing tramway track in Forest Road, and has applied to the Minister of Transport for sanction to a loan of £77,140 to carry out the work.

Telegraph and Telephone Notes.

Czecho-Slovakia.—LONG-DISTANCE TELEPHONY.—The single heavily-overloaded telephone line connecting Warnsdorf with Reichenberg has been relieved by the installation of a new line running from Warnsdorf through the industrial districts of Rumburg and Schluckenau. At the same time, new lines linking Rumburg with Warnsdorf and Warnsdorf with Schönlinde have been opened, which make the rebuilding of the Warnsdorf station and the erection of a trunk office a necessity. Furthermore, the long-distance service between Schwerwesterstadten, Tetschen, and Bodenbach by the cabling of the network and the laying of a cable from Bodenbach to Tetschen across the Northern Railway bridge, as well as the centralising of the telephone service in Tetschen, will be greatly facilitated.

India.—RADIO "BEAM" STATIONS.—The Government of India has signed a contract with the Indian Radio Telegraph Co., which holds the Marconi Co.'s patent rights, for the erection of a "beam" radio-telegraph station for communication with England in connection with the Empire "chain." The company, whose headquarters are in Bombay, has an authorised capital of three crores of rupees, and almost all the directors are prominent Indians. It is proposed to erect one "beam" station at Kirkee, near Poona, which will be followed by three others as traffic increases. The first station will be completed by the end of 1925.—*Daily Telegraph.*

Radio-Telephony at Sea.—LIGHT SHIPS' INSTALLATIONS.—The Basrah port authorities have arranged for Marconi radio-telephone installations of the YB type to be fitted on their dredgers *Liger* and *Tiger*, and also for a shore station with similar equipment. A wireless bell will be included in the installation, thus obviating the necessity for maintaining a continuous watch; the equipment will enable any of the stations to call the others with the facility of an ordinary telephone. The 100-watt transmitter has a range for telephony of from 35 to 80 miles; the telegraphy radius is from 100 to 200 miles. Similar installations have been in service for some time in various British lightships and dock and harbour authorities' buildings. Another group of Trinity House light vessels and a shore station at Cromer are also to be equipped with 200-watt YD telephone sets. This is the third group of light vessels to be equipped with radio-telephone apparatus for Trinity House by the Marconi Co. The aerial of the Cromer shore station will be supported by two towers, each 70 ft. in height.

The Telegraph Service.—POLE LINES.—The Post Office and the London Borough Councils are having an argument about telegraph poles. Many public bodies have protested against telegraph poles being erected in narrow footways, and the Post Office authorties have agreed to place all wires underground, provided that the Councils pay the difference, if the cost exceeds the expense, plus 20 per cent., of putting the same wires overhead, says the *Evening News*. The Post Office also makes it a condition that it be allowed to carry out the reinstatement itself, but the Councils do not agree to this.

The Telephone Service.—PRIVATE AUTOMATIC PLANT.—On February 23rd the Mayor of Hampstead made the first call on the municipal Relay telephone system just installed, says the *Daily Telegraph*. Hampstead is the first of the metropolitan boroughs to have its various municipal departments linked by automatic telephony. By means of a central switchboard in the Town Hall connection is made with other rooms in the building or with any office or depôt some distance away. The General Post Office has installed the plant.

Radio Notes.

Aerials.—EDINBURGH.—By the authority of the Town Council of Edinburgh, notices have been served on nearly 200 users to remove within 14 days, under threat of prosecution, aerials which have been placed across the city streets. The penalty for non-compliance is 40s. a day.

TRURO.—At a meeting of the City Council recently it was reported that an enthusiast had fixed an aerial across a thoroughfare, and it was proposed that he should be called upon to remove it. It was explained that the Council's policy was that all aerials must be on private property and not across streets, and the recommendation as to removal was passed.

Sweden.—NEW STATION.—The new radio broadcasting station at Varberg is completed, making direct radio communication between Sweden and the United States possible for the first time, says *Commerce Reports*. There are more than 37,000 licences held by operators of receiving sets in Sweden, and the Government is building a number of broadcasting stations throughout the kingdom. About 81 per cent. of the wireless, telephone, and telegraph apparatus imported in 1923 came from the United States.

Turkey.—PRICES.—Prices of thermionic valves quoted by American firms are 200 per cent. higher than those of European competitors. Complete radio sets offered by European manufacturers are 30 per cent. cheaper than corresponding American equipment. According to *Commerce Reports*, local firms are, however, showing very little interest in these articles.

Wireless Telegraphy and Signalling Bill.—PROTESTS.—The Council of the Institution of Electrical Engineers, being of opinion that there are new provisions in the Bill, as compared with the Act of 1904, which are likely to prove detrimental to the progress of wireless telegraphy, of radio science generally, and of other electrical matters, has invited the Postmaster-General to defer any immediate further proceedings with the Bill so that the Council may have time to give careful consideration to its provisions, which it considers to be of far-reaching importance, and an opportunity of submitting to him its representations thereon. In view of the urgency of the matter, the Council's letter has been circulated to the members of the House of Commons and the Press. Other bodies, including the Radio Society of Great Britain, are protesting against the passage of the Bill in its present form.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Aberdare.—March 31st. Urban District Council. Overhead and underground l.p. distributing mains and underground h.p. and l.p. feeders; public lighting; sub-station building, plant and equipment. (See this issue.)

Ashton-under-Lyne.—March 5th. Board of Guardians. Electric lighting materials for two children's homes, Mossley Road. Specifications from Mr. H. H. Daley, clerk to Board of Guardians, Poor Law Offices, St. Michael's Square, Ashton-under-Lyne.

Australia.—SYDNEY.—April 2nd. Postmaster-General's Department. Accumulator batteries and parts.*

MELBOURNE.—April 1st. Victorian Government Railways. One 15-ton electric travelling crane.*

April 7th. Commonwealth P.M.G.'s Department. Wall and table telephone sets. (February 13th.)

Bilston.—March 26th. Urban District Council. Pumping station at Woombourn, Staffs., of two pumping units, complete with crane tanks, electric lighting plant, &c. Specification (£5) from Mr. J. L. Arlidge, clerk to the Council, Town Hall, Bilston.

Bradford.—March 3rd. Corporation. Electric light installation at Feversham Street schools and baths, &c., and at Thornbury school. Specifications from the City Architect, Town Hall, Bradford.

Bridlington.—March 16th. Electricity Department. Stores for 12 months, including electric lamps, lampholders, conduit, fittings, switches, cable, &c. (See this issue.)

Brighton.—March 5th. Tramways Department. 2,800 tungsten filament lamps, 12 tons brake blocks, 108 steel tires. Specifications from the office of the Tramways Engineer, Lewes Road, Brighton.

Bristol.—March 10th. Board of Guardians. Electrical fittings for six months. Mr. T. S. Lamb, clerk, St. Peter's Hospital.

Denmark.—COPENHAGEN.—March 10th. Lighting Department. Rotary converters.*
March 17th. Transformers.*

Dover.—March 4th. Harbour Board. Stores and materials for 12 months, including electrical sundries, cables, &c. Mr. R. Mowll, registrar, Castle Street, Dover.

Edinburgh.—March 9th. Electricity Supply Department. E.h.p. switchgear and 3-phase transformers. (February 20th.)

Ilkley.—March 11th. Electricity Department. Street lamp standards and bracket arms, lanterns, automatic time switches, and cable. (See this issue.)

India.—March 3rd. India Store Department. Accumulators for train lighting.
March 17th. Electric generating sets and switchboards. (February 20th.)

Kettering.—March 4th. Electricity Department. Two miles h.p. and 7 miles l.p. l.c. s.t. cable. (February 20th.)

Kirkwall.—March 14th. Trustees of the Thoms Bequest. Electrical installation at St. Magnus Cathedral, Kirkwall. Schedules from Mr. James A. Liddle, Pentland Engineering Works, Robb's Lane, Gorgie, Edinburgh.

Leeds.—The Corporation Tramway Committee is to invite tenders for 150 new tramway cars.

London.—KENSINGTON.—March 5th. Board of Guardians. New internal telephone installation for the Marloes Road Institution. (February 13th.)
BERMONDSEY.—March 4th. Board of Guardians. Six months' supply of electric lamps. Specifications from Mr. H. H. Reeve, clerk to the Guardians, 283, Tooley Street, S.E.1.
HOLBORN.—March 4th. Borough Council. Electric lamps required during 12 months ending March 31st, 1926. Form of tender from Borough Surveyor, Town Hall, High Holborn, W.C.1.
Board of Guardians. March 11th. Electrical fittings for six months. Mr. C. J. Cross, clerk, 53, Clerkenwell Road, E.C.1.
ISLINGTON.—March 10th. Board of Guardians. Electrical supplies for six months. Mr. A. King, clerk, Guardians' Offices, St. John's Road, Upper Holloway, N.19.
METROPOLITAN ASYLUMS BOARD.—March 25th. Installation of 144-tube economiser and new continuous drying machine, engineering work for new central boiler house, revision of laundry engineering arrangements, installing electric light and power wiring in boiler house and laundry, covering boilers, steam feed and suction mains, &c., at the South Western Fever Hospital, Stockwell. (See this issue.)

Maesteg.—March 10th. Urban District Council. Installation of electric lighting at the Council offices, Town Hall, and markets. (See this issue.)

Salford.—March 2nd. Tramways Committee. Supply of armature coils and electric lamps, steel tires, castings, &c. General manager, Tramways Department, 32, Blackfriars Street, Salford.

South Africa.—March 16th. South African Railways and Harbours. Machine tools, motors, &c.*
CAPE TOWN.—March 24th. City Council. Special street-lighting fittings.*
JOHANNESBURG.—April 20th. Electricity Supply Commission, Union of South Africa. Hydro-electric power station at Sabie, Eastern Transvaal.*
Municipal Council. March 26th. Two 1,080-kVA single-phase transformers.*
LADYSMITH.—April 2nd. Municipal Council. Material for converting d.c. to a.c. supply for lighting and power.*

Stoke-on-Trent.—March 10th. Electricity Department. 12 months' supply of mains and cables, a.c. and d.c. meters, sub-station switchgear and static transformers. Steam piping with welded flanges, valves, and steam traps, water pipes, valves, &c. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1..

Closed.

Birmingham.—Board of Guardians. Accepted:—
Cable (£436).—Siemens Bros. & Co., Ltd.

Bury St. Edmunds.—
Turbine and generator plant for light and power at the new sugar-beet factory.—W. H. Allen, Sons & Co., Ltd.

Carlisle.—
Installing electric light in the new out-patient department of Cumberland Infirmary.—R. M. Hill & Sons.

Dublin.—Dublin United Tramways Co., Ltd. Accepted:—
One 3,000-kW turbo-generator, with surface condensing plant, &c.—W. H. Allen, Sons & Co., Ltd.—*Irish Electrician.*

Borough Commissioners. Accepted:—
Transformers for 12 months.—British Electric Transformer Co., Ltd.—*Irish Builder and Engineer.*

Dartford.—Urban District Council. Accepted:—
One 750-kW rotary converter.—Crompton & Co., Ltd.

Glasgow.—Electricity Committee. Recommended:—
Kelvinside and Dennistoun sub-stations.
Two 1,875-kVA transformers.—Ferranti, Ltd. (£2 683). Two ditto ditto: British Electric Transformer Co., Ltd. (£2,683).
Dalmarnock power station extensions.
Sluice valves (£731).—Glenfield & Kennedy, Ltd.
C.i. pipes (£1,026).—Shaw (Glasgow), Ltd.
Three-ton derrick crane and grab (£695).—Butter Bros. & Co.
Circulating-water and exhaust pipe (£952).—Messrs. Mechan, Ltd.
Tramways Committee. Recommended:—
Commutators.—Manchester Armature Repair Co., Ltd.
Trolley wire.—R. Johnson & Nephew, Ltd.
Steel tubing.—Stewarts & Lloyds, Ltd.
Health Committee. Accepted:—
Electric light installation at Knightswood Hospital (£612).—Johnson, Park and Co.
Housing Committee. Recommended:—
Electric light installations at the Balmoral housing scheme (£581) and at West Craighton housing scheme (£416).—D. Henderson.

Government Contracts.—The following Government contracts were placed during January, 1925:—

ADMIRALTY, CONTRACT AND PURCHASE DEPARTMENT.
Accumulators, batteries, and cells.—London Battery & Cable Co., Ltd.; General Electric Co., Ltd.; Chloride Electrical Storage Co., Ltd.; D.P. Battery Co., Ltd.; Batteries, Ltd.; Fuller's United Electric Works, Ltd.
Bridge meggers.—Evershed & Vignoles, Ltd.
Conduit tubing and fittings.—Barton & Son, Ltd.; Eureka Conduits and Fittings Co.; Electrical Conduits, Ltd.; General Electric Co., Ltd.
Water-cooling plant.—Heenan & Froude, Ltd.
5-ton electrically-driven gantry.—Sir W. Arrol & Co., Ltd.
Motors, alternators, and spares.—Newton Bros. (Derby), Ltd.
Telemotor operating panels.—McTaggart, Scott & Co., Ltd.
Platinum wire.—Johnson, Matthey & Co., Ltd.
Resistance testing sets.—Everett, Edgcumbe & Co., Ltd.

WAR OFFICE.
Batteries.—Pritchett & Gold and E.P.S. Co., Ltd.
Cable (electric).—W. T. Glover & Co., Ltd.
Electrification of crane.—J. Carrick & Sons, Ltd.
Electric crane.—Vaughan Crane Co., Ltd.
X-ray apparatus.—Kodak, Ltd.
Renewal of fuel economiser.—E. Green & Son, Ltd.
Electric lighting installations.—Hounslow Barracks: Alpha Electric and Mfg. Co., Ltd. Southill Barracks, Chatham: Buchanan & Curwen. Shoerness Barracks: Buchanan & Curwen. Budbrook Barracks, Warwick: Electric Trades Supply, Ltd.

AIR MINISTRY.
Battery booster.—Martlesham Heath: Tudor Accumulator Co., Ltd.
Underground cables.—Northolt: G. E. Taylor & Co.
Pumps.—Iraq: Rees Roturbo Mfg. Co., Ltd.
Switchboard.—Sarafand: Erskine, Heap & Co., Ltd.
Electric speed indicators.—Record Electrical Co., Ltd.
Microphones.—Telephone Mfg. Co., Ltd.
W/t. receivers.—H. W. Sullivan, Ltd.
Transmitters.—Gambrell Bros.
W/t. valves.—British Thomson-Houston Co., Ltd.; General Electric Co., Ltd.

POST OFFICE.
Manufacture, supply, drawing-in and jointing cable.—Manchester-Sheffield: British Insulated & Helsby Cables, Ltd. Brixton-Holborn and Central-Streatham Junction: Callender's Cable & Construction Co., Ltd. Lancaster-Kendal and Kendal-Windermere: W. T. Henley's Telegraph Works Co., Ltd.
Electric lighting installations.—Bishopsgate Telephone Exchange: Electric Power Installations Co. Sloane Telephone Exchange: A. Hawkins and Sons.
Electric passenger lift.—Birmingham H.P.O.: J. Bennie, Ltd.
Telephone exchange equipment.—Coatbridge: Siemens Bros. & Co., Ltd.; sub-contractors: Hart Accumulator Co., Ltd., for batteries; English Electric Co., Ltd., for charging machine; Crompton & Co., Ltd., for ringing machine. Shipley: Siemens Bros. & Co., Ltd.; sub-contractors: Chloride Electric Storage Co., Ltd., for batteries; English Electric Co., Ltd., for charging machine; Crompton & Co., Ltd., for ringing machine. Toll: Western Electric Co., Ltd. G.P.O. (South) trunk: Western Electric Co., Ltd. Battersea: General Electric Co., Ltd.; sub-contractors: D.P. Battery Co., Ltd., for batteries; Crompton & Co., Ltd., for machines. St. Annes-on-Sea: General Electric Co., Ltd. Huddersfield: General Electric Co., Ltd. Kensington: Automatic Telephone Mfg. Co., Ltd. Park: Automatic Telephone Mfg. Co., Ltd. Regent: Automatic Telephone Mfg. Co., Ltd. Paddington: Automatic Telephone Mfg. Co., Ltd. Victoria: Automatic Telephone Mfg. Co., Ltd. Gerrard: Automatic Telephone Mfg. Co., Ltd. Riverside: Automatic Telephone Mfg. Co., Ltd. Avenue: Automatic Telephone Mfg. Co., Ltd.
Private telephone installations.—Scottish Automobile and General Assurance Co., Ltd., Dunlop Rubber Co., Ltd., Bury Co-operative Society, Ltd., Morris Motors, Ltd., Cardiff Union: Relay Automatic Telephone Co., Ltd.
Telephone repeater station, repeater equipment.—Birmingham: General Electric Co., Ltd.
Telephone apparatus.—British L. M. Ericsson Mfg. Co., Ltd.; General Electric Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Telegraph Condenser Co., Ltd.; Western Electric Co., Ltd.
Testing and protective apparatus.—S. Turner, Ltd.
Telephone cabinets.—Siemens Bros. & Co., Ltd.
Cable (various).—British Insulated & Helsby Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Connolly's (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Glover & Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Receiver of H. W. Smith, Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Secondary cells.—D.P. Battery Co., Ltd.
Loading coils.—Western Electric Co., Ltd.
Compound.—W. H. Keys, Ltd.
Insulators.—T. De La Rue & Co., Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; Elliott's Metal Co., Ltd.; Enfield Cable Works, Ltd.; R. Johnson & Nephew, Ltd.; Johnson, Clapham & Morris, Ltd.; Pirelli-General Cable Works, Ltd.; Shropshire Iron Co., Ltd.; F. Smith and Co., Ltd.; J. Wilkes, Sons & Mapplebeck, Ltd.
Copper wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; R. Johnson & Nephew, Ltd.; Pirelli-General Cable Works, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., Ltd.
Enamelled wire.—Macintosh Cable Co., Ltd.

H.M. OFFICE OF WORKS.
Engineering services.—Rewiring Cornwall House, S.E.: Electrical Installations, Ltd. Rewiring Somerset House, W.C.: R. Langston Jones and Co. Rewiring Exchequer and Audit Office: Tredegars, Ltd.

CROWN AGENTS FOR THE COLONIES.

Electric cable.—W. T. Henley's Telegraph Works Co., Ltd.
Electric light fittings.—Stone & Co., Ltd.
Porcelain insulators.—Taylor, Tunnicliff & Co., Ltd.
Plant and material for power station.—Ruston & Hornsby, Ltd.
Telegraph ironwork.—Siemens Bros. & Co., Ltd.; Bullers, Ltd.
Telephone cables.—Siemens Bros. & Co., Ltd.
Telephone switchboards.—British L. M. Ericsson Mfg. Co., Ltd.
Copper and bronze wire.—Shropshire Iron Co., Ltd.
Overhead line wire.—F. Smith & Co., Ltd.

Ilford.—Urban District Council. Accepted:—
One 500-kW rotary converter equipment (duplicate of one recently supplied).—Crompton & Co., Ltd.

Irish Free State.—Contracts placed by the Controller of Stores, Department of Posts and Telegraphs, January, 1925:—
Conduit elbows.—Barton & Sons, Ltd.
Earth plates.—Walls, Ltd.
Electric lamps.—Edison Swan Electric Co., Ltd.
Porcelain insulators.—General Electric Co., Ltd.; F. Routledge.
Telephone bells.—Peel-Conner Telephone Works.
Telephone cords.—Phœnix Telephone & Electric Works, Ltd.; Western Electric Co., Ltd.
Telephone plugs.—Phœnix Telephone & Electric Works, Ltd.
Switchboard wire.—British Insulated & Helsby Cables, Ltd.
G.I. wire.—W. F. Dennis & Co. —*Irish Electrician.*

Leicester.—Electricity Committee. Accepted:—
Extension at East Park Road sub-station (£1,189).—Chilham & Co., Ltd.
Rotary-converter equipment (£4,171).—British Thomson-Houston Co., Ltd.

Lochaber. — HYDRO-ELECTRIC SCHEME. — The tender of Messrs. Balfour, Beatty & Co. at £1,750,000 has been accepted for the Lochaber hydro-electric scheme of the North British Aluminium Co. The contract involves the construction of a 15-mile tunnel from Loch Treig to the neighbourhood of Fort William, where the power station for the new aluminium works will be situated. Work will commence shortly, and will give employment to fully 2,500 men.

Limerick.—Harbour Board. Accepted:—
Electrical apparatus for opening and closing the swing bridge across the Shannon (£1,018).—Metropolitan-Vickers Electrical Co., Ltd.

London.—Contracts have been placed with the General Electric Co., Ltd., for 50,980 Robertson carbon-filament lamps for the Admiralty, and for 10,000 telephone switchboard lamps for the G.P.O. The Edison Swan Electric Co., Ltd., is supplying carbon-filament lamps, meters and shunts to the Admiralty, and switchboard lamps to the G.P.O.

METROPOLITAN WATER BOARD.—Alterations and improvements to the external telephone system at the Engineer's Department:—

Dean & Co., Ltd. (Recommended.)	**£485**
Baxter & Caunter, Ltd.	472
Girdlestone & Co.	497

STEPNEY.—Electricity Supply Committee. Accepted:—
½ ton each tinman's and blowpipe solder (£306).—G. W. Neale, Ltd.
1,000 gross yd. 1-in. white tape (£171).—J. MacLellan & Co., Ltd.
50 tons pitch (£137).—Forbes, Abbot & Lennard, Ltd.
2-way t/c. boxes (£104).—Universal Electrical Mfg. Co., Ltd.
3,000 maximum demand indicators (£6,519).—Reason Mfg. Co., Ltd.

One 1,500-kW and two 1,000-kW converting plants:—

Ateliers de Constructions Electriques de Charleroi	15,075
Alternative (three 1,500-kW machines). (Recommended.)	**£16,625**
General Electric Co., Ltd.	16,803
Metropolitan-Vickers Electrical Co., Ltd.	17,384
Mather & Platt, Ltd.	17,455
Alternative	19,188
British Thomson-Houston Co., Ltd.	17,863
Alternative	17,022
English Electric Co., Ltd.	19,205
Alternative	18,729
Bruce Peebles & Co., Ltd.	19,553

Wiring for electric lighting of Edward Mann Buildings:—

H. J. Cash & Co., Ltd. (Recommended.)	**£224**
Electrical Installations, Ltd.	272
V. G. Middleton & Co., Ltd.	272
L. G. Tate & Co.	279

WESTMINSTER.—Works Committee. Recommended:—
Renewal of the electric lighting installation at the Monck Street depôt.

Edmundson's Electricity Corporation. (Recommended.)	**£325**
Speedy & Eynon	368
Electrical Contracts & Maintenance Co. (1925), Ltd.	382
Drake & Gorham, Ltd.	411
British Mercedes, Ltd.	413
Hewson & Lown	532

Baths Committee. Recommended:—
Rewiring at the Great Smith Street baths (£247).—Buchanan & Curwen.

BERMONDSEY.—Baths Committee.
Electrical installation at the new baths:—

Bell Bros. & Co. (Recommended.)	**£631**
Domestic & General Electrical Co., Ltd.	763
J. O. Grant & Taylor	823
V. G. Middleton & Co., Ltd.	915
Anderson Angell & Co., Ltd.	926
G. E. Taylor & Co.	958
J. B. Marr & Co., Ltd.	991
Electrical Installations, Ltd.	1,019
Pinching & Walton	1,030
Bermondsey Electricity Department	1,097

HACKNEY.—Housing Committee.
Electric wiring and lighting of 48 maisonettes in Fletching Road.

C. Goodman & Co., Ltd. (Recommended)	**£394**
J. H. Golding	405
Troughton & Young	478
Electricity Depart., Hackney Borough Council	480
Marryatt & Place	549
Tredegars (1923), Ltd.	576

CITY & SOUTH LONDON RAILWAY. Accepted:—
Construction of the southern section of the City Railway between Dorset Road, Clapham, and North Morden.—Foundation Company, Ltd.

Luton.—Sewage Committee. Accepted:—
Two water-tube boilers, fitted with Hopkinson's fittings (£1,378); two super-heaters (£340).—Babcock & Wilcox, Ltd.

Electricity Committee. Accepted:—
Main transmission cable, for supply to Dunstable Corporation: 6½ to 7 miles of cable (at 12s. 9½d. per yd.).—British Insulated & Helsby Cables, Ltd.

Manchester.—Electricity Committee.
Renewal of the contract for electric cookers.—Jackson Electric Stove Co., Ltd.

Pembroke (Co. Dublin).—Urban District Council. Accepted:—
.06 sq. in. lead-sheathed and steel armoured cable.—Deutsche Kabelwerke A. G.—*Irish Electrician.*

Swindon.—G.W. Rly. Co. Accepted:—
Two 500-kW motor-generators, with switchgear and cables.—Electric Construction Co., Ltd.

Tynemouth.—Electricity Committee. Accepted:—
Cable.—Metropolitan-Vickers Electrical Co., Ltd.; Macintosh Cable Co., Ltd.

Willesden.—Electricity Committee. Recommended:—
1,000-kW motor-generator (£4,635).—General Electric Co., Ltd.
Four transformers.—British Electric Transformer Co., Ltd.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

1/5-h.p. "universal" motors (must be entirely British made).

A battery having as trade mark the letters RFR in a circle.

Forthcoming Events.

Royal Society of Arts.—Monday, March 2nd. At John Street, Adelphi. At 8 p.m. Cantor Lecture, "The Inner Structure of Alloys," by Dr. W. Rosenhain, F.R.S.

Glasgow Corporation Electricity Department Engineering Society.—Monday, March 2nd. At the Welfare Hall, St. Andrew's Cross Works, Glasgow. At 7.45 p.m. Paper on "Generating Stations in France," by Mr. C. W. Marshall.

Ideal Home Exhibition.—March 2nd to 25th. At Olympia, W.

Nottingham Society of Engineers.—Monday, March 2nd. At the Victoria Station Hotel. At 7.30 p.m. Paper on "Selling Electric Power," by Mr. W. Y. Anderson.

Institute of Transport.—Monday, March 2nd. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 5.30 p.m. Paper on "The Manipulation of Exceptional Passenger Traffics," by Mr. E. C. Cox.

Society of Engineers.—Monday, March 2nd. At Burlington House, W. At 5.30 p.m. Paper, "Notes on Preparing a Tender," by Mr. R. I. Money.

Electrical Society of Glasgow.—Tuesday, March 3rd. At 30, Gordon Street, Glasgow. At 7.30 p.m. Paper on "Hydro-Electric Plant," by Mr. A. Arthur.

Institute of Marine Engineers.—Tuesday, March 3rd. At the Institute, The Minories. At 6.30 p.m. Paper on "Fuel Economy," by Mr. E. W. L. Nicol.

Roentgen Society.—Tuesday, March 3rd. At 32, Welbeck Street, W. At 8.15 p.m. Ordinary Scientific Meeting.

Electrical Power Engineers' Association (Derby and District Section).—Wednesday, March 4th. At the Welbeck Hotel, Nottingham. At 7 p.m. Lecture on "Some Tendencies in Modern Steam Raising Practice," by Mr. P. E. Rycroft.

(Southern Section).—Friday, March 6th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 7 p.m. Lecture on "The Development of Boiler House Control Instruments," by Mr. H. W. Healy.

Institution of Electrical Engineers.—Thursday, March 5th. At the Institution, Victoria Embankment, W.C. At 6 p.m. Paper on "The Post Office and Automatic Telephones," by Col. T. F. Purves.

INFORMAL MEETING.—Monday, March 2nd. At the Engineers' Club. At 7.30 p.m. Smoking concert.

(North-Midland Centre).—Friday, March 6th. At the Hotel Metropole, Leeds. At 6.45 p.m. Annual dinner.

(North-Western Centre).—Tuesday, March 3rd. At the Engineers' Club, Manchester. At 7 p.m. Paper on "Electricity in Mines," by Major E. I. David.

(Western Centre).—Monday, March 2nd. At the South Wales Institute of Engineers, Cardiff. At 6 p.m. Paper on "Drive of Power-station Auxiliaries," by Messrs. L. Breach and H. Midgley.

(East Midland Sub-Centre).—Tuesday, March 3rd. At Loughborough College. At 6.45 p.m. Paper on "The Constants of an Electric Circuit," by Mr. R. C. Clinker.

(Wireless Section).—Wednesday, March 4th. At the Institution, Victoria Embankment, W.C. At 6 p.m. Papers on "Current Transformer Methods of Producing Small Known Voltages and Currents at Radio Frequencies for Calibrating Purposes," by Mr. D. Dye; and on "The Measurement of Frequency and Allied Quantities in Wireless Telegraphy."

Junior Institution of Engineers.—Friday, March 6th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "How to Apply for a Job and How Not to Do It," by Mr. E. F. Etchells.

(North-Western Section).—Monday, March 2nd. At the Manchester Geographical Society. At 7.15 p.m. Paper on "Power Factor Improvement," by Mr. G. H. Ayres.

Institution of Mechanical Engineers.—Friday, March 6th. At the Institution, Storey's Gate, S.W. At 7 p.m. Informal meeting. Discussion on "Pitfalls for Patentees."

Birmingham Electric Club.—Friday, March 6th. At the Grand Hotel, Colmore Row, Birmingham. At 7 p.m. Annual dinner.

Salford Technical and Engineering Association.—Saturday, March 7th. At the Royal Technical College, Salford. At 7 p.m. Paper on "H.p. Switchgear," by Mr. V. A. Brown.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, March 7th. At the South Wales Institute of Engineers, Cardiff. At 6 p.m. Paper on "The Cleaning of Used Oils by Centrifugal Force," by Mr. N. W. Pragnell.

Royal Institution of Great Britain.—Saturday, March 7th. At 21, Albemarle Street, W. At 3 p.m. Lecture on "The Counting of the Atoms," by Sir Ernest Rutherford, F.R.S.

Electricity in the Carbonisation Industries.

By H. SEYMOUR.

ELECTRIC power is now established as being the most reliable, convenient, and economical means, particularly in the handling of the raw coal and by-products from carbonisation processes, of operating the auxiliary plant of gas works, &c.; the motors may be direct-coupled, and possess the merit of requiring little attention.

In telpher installations electric motors are used both for raising the skip and propelling the carriage, and an instance of such an application is shown in fig. 1, where a track 70 ft. high and 500 ft. long has been installed to handle coal by telpher from the dump to storage or the retort bunkers at the rate of 40 tons per hour. In another case the lifting capacity of the skip of an electrically-driven telpher is three tons at 70 ft. per minute, the telpher carriage having a travelling speed of 600 ft. per minute. The skip-raising motor of this plant is rated at 23 h.p., and the travelling motor at 6 h.p., both operating off a 220-V d.c. supply, with a single overhead line and rail return.

Motors in gas works are usually standardised, and an interesting example of such standardisation is found at the Rochester gas works, where the motors are, with one exception, all of one size, *viz.*, 10 h.p. One such motor is employed for driving a tray conveyor and the coal crusher; another drives the conveyor for carrying the coal to store; a third operates a retort conveyor, and a fourth the scraper conveyor for conveying the coal to the bunkers, the capacity of the whole plant being from 40 to 50 tons per hour. Many such interesting installations are to be found in and around London. At the Sydenham works of the South Suburban Gas Company at 30-b.h.p. motor, fig. 3, with under-type backgearing is installed, a low-speed shaft chain driving a hot coke elevator with a capacity of 40 tons per hour. In one case a 4-b.h.p. squirrel-cage induction motor, fig. 2, drives a T.T. conveyor, a "Lancashire" patent slip clutch coupling being employed between the motor and the worm gear to allow the motor to start up light and gradually set the conveyor moving. This motor is started by means of a star-delta starter, and the combination is capable of starting against two and a half times the full-load torque.

In gas works retort houses, hand stoking has been almost entirely superseded by machine stoking, and electric motors form a very important part of the coal charging and coke discharging machinery. A large five-tier stoking machine equipped with B.T.-H. motors is shown in fig. 4. Machines of this type are built on four wheels so that they can be moved down the whole length of the retort house, and carry for their various purposes a charger motor for operating the coal charging machinery, and a pusher motor for driving the coke discharging apparatus, while another motor raises or lowers the whole equipment to the levels of the various retorts, and another similar motor propels the charger along the retort house rails.

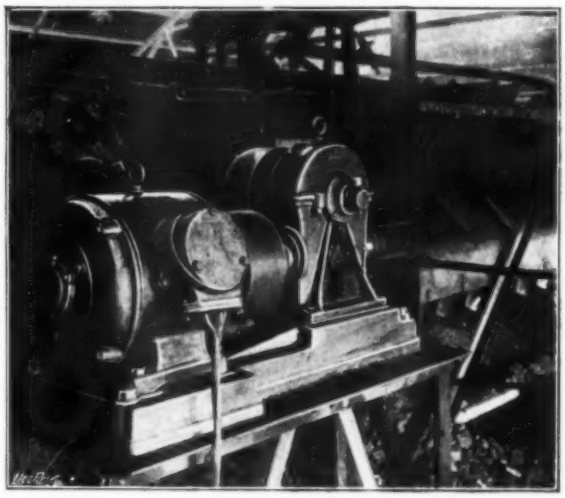


Fig. 2.—4-h.p. Induction Motor Driving T.T. Conveyor.

Exhausters, compressors, fans, boosters and a host of other auxiliary machinery used in the carbonisation industries provide examples of the utilisation of electric power. An instance is shown in fig. 6, in which a single stage gas exhauster used to deal with 350,000 cu. ft. of coke-oven gas per hour at 15.5 deg. C. inlet temperature against a vacuum of 10 in. w.g. at the exhauster inlet, and 53 in w.g. at the delivery, is driven at 4,100 r.p.m. through speed-increasing gear by a slip-ring induction motor working off a 3-phase supply at 440 volts, 25 cycles.

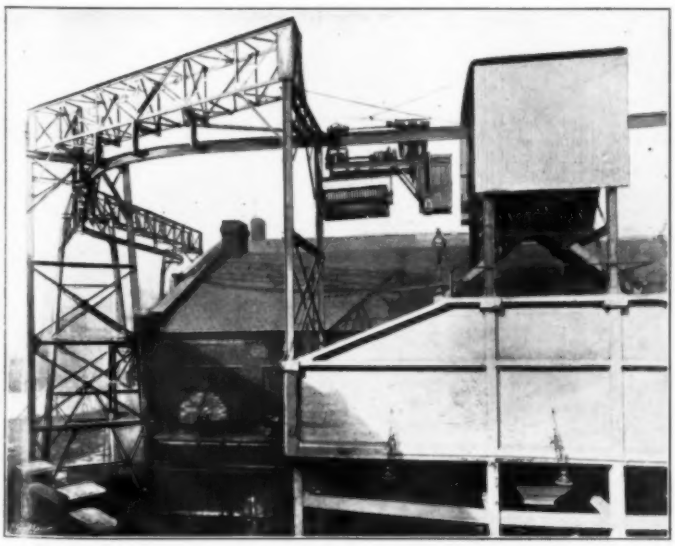


Fig. 1.—Telpher Installation with track 70 ft. high and 500 ft. long.

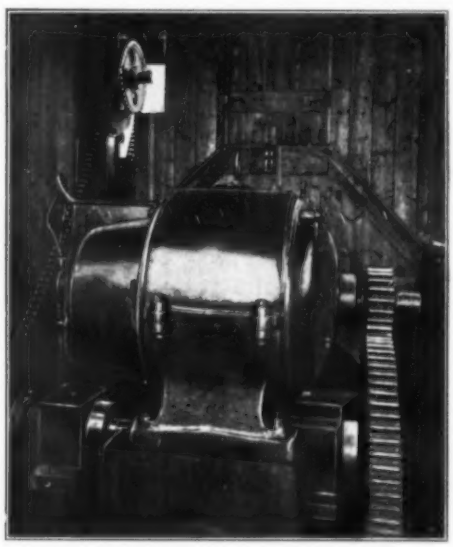


Fig. 3.—30-h.p. Motor at Sydenham Gas Works.

As will very readily be appreciated, motors in gas works operate under very severe conditions, as they are almost invariably exposed to either coal or coke dust or other deleterious influences. To be successful, they must be capable of withstanding dust, fumes (often containing sulphur) and high temperatures. Usually the machinery to be operated is heavy and runs at low speeds.

Where motors of the d.c. type are installed, they are, with very few exceptions, of very stout construction and

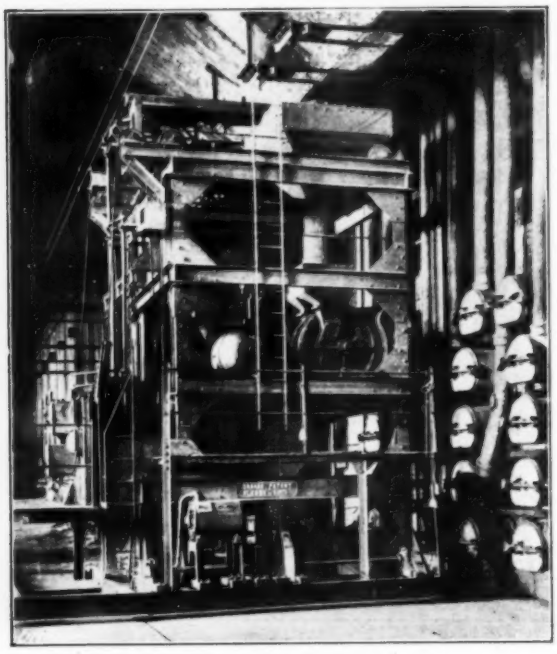


Fig. 4.—Large 5-Tier Stoker with B.T.-H. Motors.

totally enclosed, special attention being paid to terminal boxes, inspection doors, and oil-well lids. In many cases the joints have special felt linings and special clamping nuts are fitted in order that the machine may be absolutely dust-tight; precautions are taken to make the insulation acid-resisting, and capable of withstanding fumes. Temperature rises are kept low, in no case exceeding 90 deg. F., and in view of the heavy starting conditions encountered in gas works, compound-wound motors are almost invariably used.

In the case of a.c. motors, the squirrel-cage induction type is one of the best machines for operating under severe conditions, and it is applicable to all purposes in gas and coke-oven works. For charging machines, hoists, heavy conveyors, and other machines requiring a heavy starting torque, a squirrel-cage motor with a specially high resistance rotor has recently been designed by the Lancashire Dynamo & Motor Company, which has proved very suitable. For continuously running motors which require a very heavy starting torque, such as for driving long band conveyors, a standard squirrel-cage motor can be used in combination with a slip clutch coupling or pulley which allows the motor to start easily, putting the conveyor into operation gradually as the motor comes up to speed.

It is impossible to give exact figures of the power required to drive gas works machinery, as the power will obviously vary with the conditions. The following figures, compiled by the Lancashire Dynamo & Motor Company, may, however, be taken as typical:—

Duty.	Approx. b.h.p.
Coal breaker, 40 tons capacity	20
Coal breaker, 20 tons capacity	12
Charging machine, 3 motors each	10-12
Wagon tipplers, according to size	10-15
Belt conveyors, 120 tons per hour	15
Waste-heat boiler fans	12-20
Gas booster, 1,500,000 cu. ft.	100
Gas booster, 1,000,000 cu. ft.	80
Shuttle conveyor	3-7
G.B. conveyors	15-20
Coke conveyors	10-12
Lift motors	12

One of the most successful applications of control apparatus is to be found in connection with the auxiliary machinery of gas works. Most of the motors used for pumps, compressors, blowers, and other similar plant are of the constant speed type, and the starter shown in fig. 7 is a popular type used at gas works. It is an Igranic "Conspede" pillar panel, and the illustration gives some idea of the accessibility of the interior—a feature very much appreciated. Though this is a manual starter, its design gives full automatic protection and fool-proof operation. The starting is accomplished by a loose handle with a simple progressive movement for accelerating, the protection being of such a nature that the use of reduction gearing or equivalent low-speed action is rendered unnecessary, so that acceleration is effected in the shortest possible time consistent with safety. The main line current is handled entirely by magnetic contacts, with renewable self-cleaning contacts and magnetic blow-outs. No-volt and overload protection is provided, both while starting and running, and the operation of these devices, either through a failure of the supply, a fault in the load, or foolish handling, makes a fresh start necessary under full protection.

For such auxiliary services as blowers and fans, face-plate rheostat starters are very suitable, provided that they are fitted with no-volt and overload releases. On the heavier plant, such as rotary scrubbers and others where considerable inertia is encountered, the starters most used are either of the face-plate or the multiple lever types.

The load factor of gas works is very bad, and the number of units generated is sometimes so low compared with the h.p. of the motors installed and the size of the generator required, that the cost per unit generated is from 2d. to 3d., and occasionally higher.

One of the most interesting electrification schemes

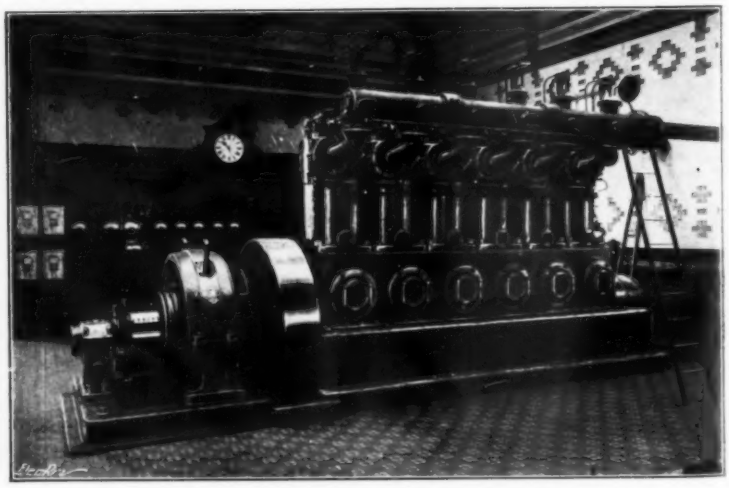


Fig. 5.—Generating Plant of the South Suburban Gas Co.

carried out recently is that of the filtration plant of the Gas Light & Coke Company at Beckton. The plant is fed from a sub-station situated in the works, a 6,000-V supply from the Woolwich station being transformed down to 440 V by means of two 500-kVA transformers, the whole controlled by a Johnson & Phillips truck type feeder panel.

The feeders to the filtration plant are 0.2 sq. in., p.i.-

l.c., s.t.a., and are laid solid in earthenware troughing filled with bitumen to protect the lead and armour covering of the cable from acids which were found to be present in the soil in which this cable is buried. These cables enter the underside of the building, and are fixed on mild steel supports under the floor until immediately beneath a standard cast iron 10-way 600-amp. distribution board. They pass up through the floor into the pump room of the filtration plant, and are led direct into the underside of the ironclad board.

From this point the various supplies are governed to each set of motor pumps, the starters for which stand by each machine, and the cable connections are all run under the floor, which in turn forms the ceiling or top of a large water storage tank, 18 ft. deep. The whole installation is by Messrs. Johnson & Phillips, Ltd.

The majority of the provincial gas undertakings make considerable use of electric power, and it is interesting to note that in 1923 the Bournemouth Gas and Water Company generated 766,280 units, the cost working out at 1.2d. per unit. The maximum day's consumption was 2,800 units, with a peak load on the generators of 400 kW. The generating plant at the Poole works consists of three 125-h.p. Westinghouse 3-cylinder vertical gas engines driving 75-kW continuous-current dynamos, and one 350-h.p., two-crank, four-cylinder tandem engine driving a 170-kW dynamo at 230 V.

Fig. 5 shows the generating plant of the South Suburban Gas Co., at Lower Sydenham. It consists of a 180-kW, 220-V, compound generator, direct coupled to a National 6-cylinder gas engine. Some part of the main switchboard is also shown.

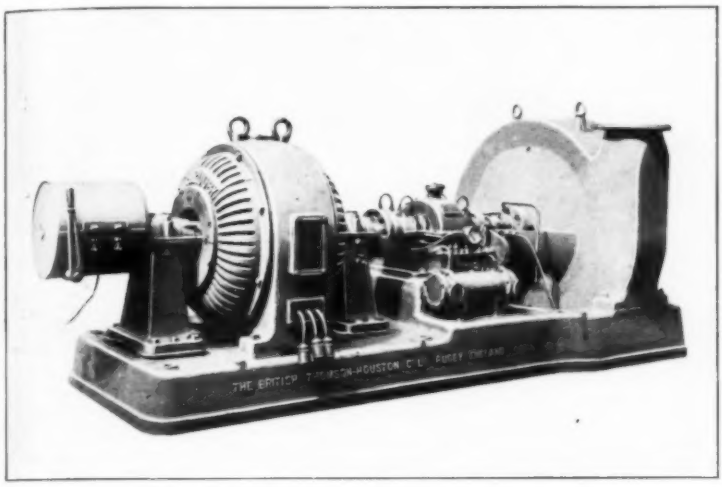


Fig. 6.—Electrically-driven Gas Exhauster.

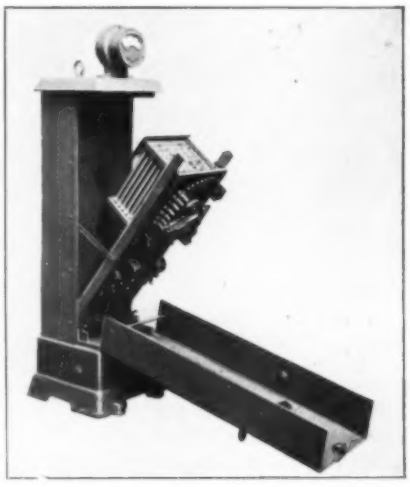


Fig. 7.—Igranic "Conspede" Pillar Panel.

Low-Type Bogie Tramcars for Darwen.

The Brush Electrical Engineering Co.'s Latest Model.

A NUMBER of tramcars designed to pass under low bridges have been put into service during the last eighteen months, notable instances being those working a Cardiff and Salford. All of these cars have been mounted on trucks of the four-wheel type, and the Brush Electrical Engineering Co., Ltd., has recently built the first low-type bogie car which has been supplied to the Darwen Corporation tramways, and by the courtesy of Mr. G. A. Newsome, A.M.I.E.E., general manager, we are able to illustrate this interesting development.

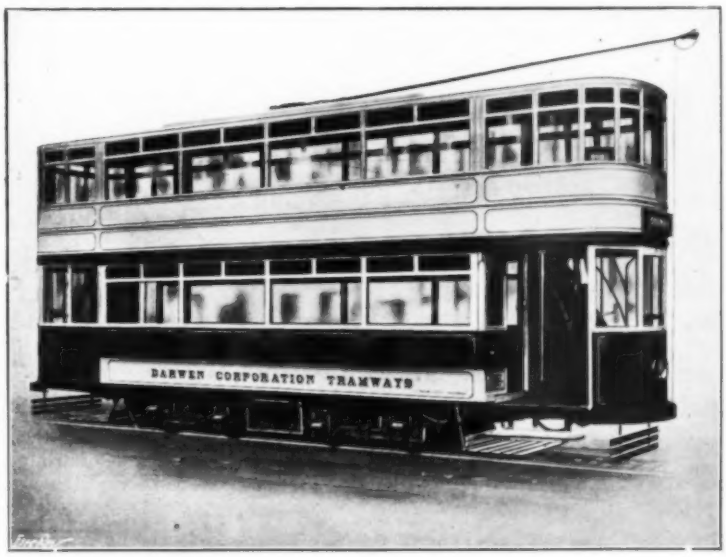


Fig. 1.—Double-deck Low-type Bogie Tramcar, Darwen Corporation.

The new cars have overcome the difficulties which prevented the use of covered double-deckers on the Darwen-Blackburn section which runs under two very low railway bridges. The alternative remedy was to lower the thoroughfare, which was prohibitive on account of cost. The car, fig. 1, has a seating capacity for 72 passengers—30 in the lower saloon, 26 in the upper saloon, and 16 on the canopies. The main feature is that the inside heights of the lower and upper saloons are approximately the same as in the ordinary tramcar, namely, 5 ft. 11½ in. and 5 ft. 10 in., but the overall height has been considerably reduced, due to the introduction of the Brush "well" underframe, which enables the floor to be dropped into the well of the underframe while maintain-

ing the correct height of the solebar to suit the height of the trucks. The car is 33 ft. 6 in. high overall, and the height to the top of the trolley plank is 14 ft. 9½ in.

The trucks are of the maximum traction side-bearing type, and are fitted with 26-in. driving and 20-in. pony wheels, and the cars have vestibule ends for both upper

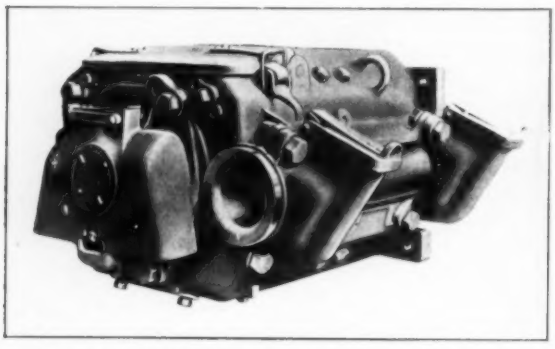


Fig. 2.—B.T.-H. Light-Weight Ventilated Interpole Traction Motor.

and lower saloons, giving ample protection to the driver, and as all seats are under cover, a maximum capacity even in the worst weather. The staircase is of the direct "straight" type, and Hudson-Bowring life-guards are fitted with Philipson adjustable sideguards on the off-side and Taylor sanding gear is fitted, four boxes being provided, arranged for operation in pairs.

To gain as much height as possible, the pitchpine trolley plank has been placed on one side of the car, and the five electric light circuits each contain five lamps; the interior fittings in the lower saloon are polished brass brackets with glass shades, whilst those in the upper saloon are polished brass brackets with nickel-plated reflectors.

The electrical equipment was supplied by the British Thomson-Houston Co., Ltd. The 40-h.p. motors (fig. 2) were specially designed for the small wheel trucks, and are of the box frame pattern, fitted with interpoles, and have a double fan on the armature shaft, which passes two streams of cool air, one through the armature and the other round the field coils.

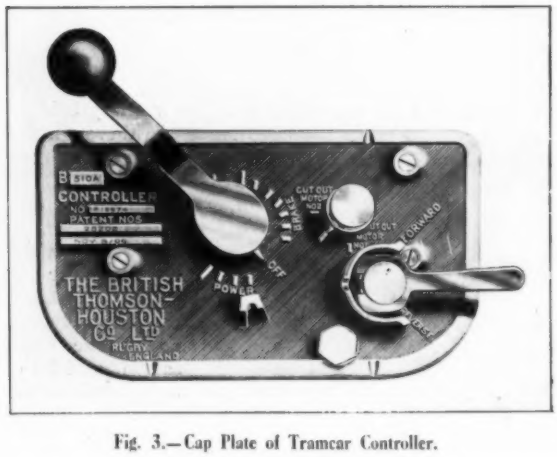


Fig. 3.—Cap Plate of Tramcar Controller.

The brush holders are mounted on mica-insulated studs clamped to machined surfaces on the magnet frame. Roller bearings are fitted to the motors, and the axle bearings are lubricated by the oily waste method, while the gear case is of the B.T.-H. 3-point suspension type, the gearing being heat treated and hardened.

The control arrangements include provision for electric braking whenever the controller handle is moved to the braking notches, irrespective of the position of the reversing handle, or the direction of motion of the car. Without opening up the controller, either motor may be cut out of circuit by means of a switch on the cap plate in full view of the motorman. This switch can be operated only by the reversing handle, and is mechanically interlocked so as to ensure that the driving handle is locked in the "off" position before any change can be made in the motor circuits. Reference to fig. 3 will show clearly the controls on the cap plate, and fig. 4 illustrates the interior of the controller, the arc deflectors being shown in the opened position. Individual blow-out coils are provided on the hinged fingers, the older type of flat spring finger having been superseded.

The circuit breakers, two of which are mounted on each car, have all their working parts readily accessible for inspection. The contacts are fitted with renewable tips and designed for cooling the arc, which is ruptured

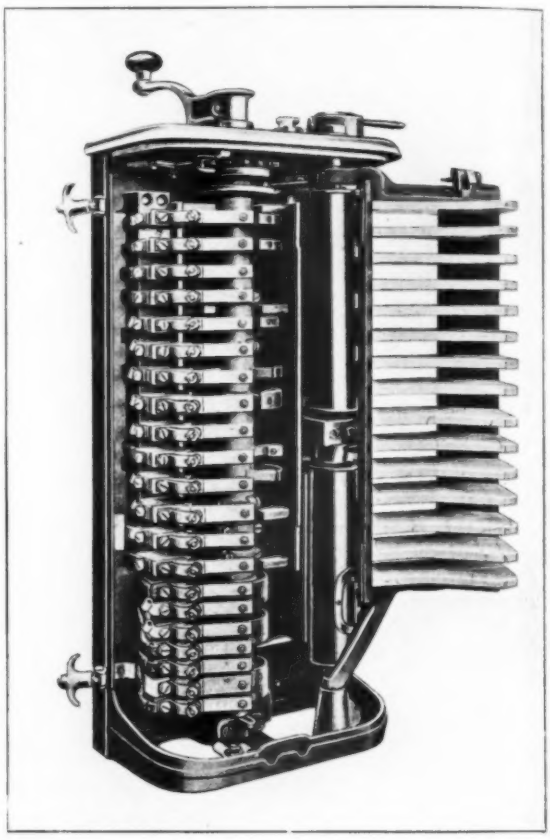


Fig. 4.—Controller with Cover removed and Arc Deflectors open.

in a strong magnetic field. Provision is made for sealing up the circuit breakers to prevent unauthorised adjustment.

The interior of the lower saloon is finished in teak and oak in the natural grain, the seats and panels being of oak and the cappings, mouldings, and ceiling bands of teak. All cappings, mouldings, &c., are of such a pattern as to minimise the accumulation of dust and dirt; the ceiling is finished in "bird's-eye" maple.

The finish of the interior of the upper saloon is very much like that of the lower saloon, with the exception that the ceiling is formed by the under-side of the roof boards, the roof sticks being exposed to view; the boards are finished in white enamel. Ventilation of the lower saloon is provided for by means of glazed frames over the side windows, the four corner ventilators being pivoted; the remainder are hinged on the lower edge. A perforated panel is also fitted over the end windows on the body side.

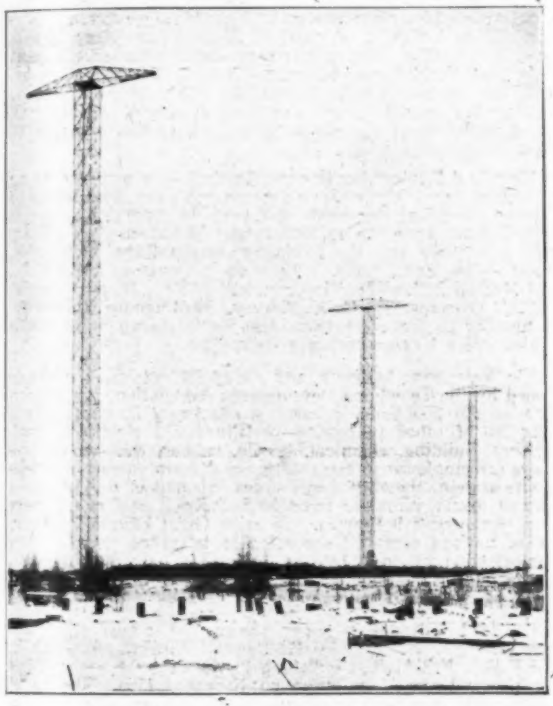
The ventilation of the upper saloon is carried out by the same means, although the glazed frames in this case are carried completely round the vestibule in addition to the body. Drop lights are also fixed in various positions.

Water Supplanting Coal.—The *Daily Mail* reports:—"New Zealand miners are complaining that the great depression in the coal industry is because hydro-electric schemes are decreasing the consumption of coal." It's a good wind that blows nobody ill.

Notes.

Tennis Court Illumination.—The municipal tennis courts at Edmonton have recently been illuminated for night play by the North Metropolitan E.P.S. Co., to the designs of the Siemens & English Electric Lamp Co., Ltd. The installation consists of a number of enamelled steel angle reflectors mounted at a height of 24 ft. along each side of the courts, with a single concentrating reflector at a suitable height at each end of the space between the courts. The lighting is very even and there is an entire absence of glare, the value being between 1 and 2.5 ft.-candles. The lamps used are of the "Siemens" 500-W gasfilled pattern.

Canadian Radio "Beam" Stations.—In our January 23rd, 1925, issue (page 140), some particulars of the "beam" radio-telegraph stations that are being erected in Canada were given and in this connection the photograph reproduced below is of interest. The stations are being erected near Montreal by Marconi's Wireless Telegraph Co. of Canada, for communication with England by means of short-wave "beam" telegraphy. Construction has reached an advanced stage, both at



Radio Masts at Drummondville, Canada.

the transmitting station at Drummondville and at the receiving station at Yamachiche, and all the masts which will carry the aerial system for the English services have been completed. The accompanying illustration shows four of the five masts at the Drummondville station which are 300 ft. in height and 650 ft. apart. Stations are also being built at the same places for "beam" radio communication with Australia. This group of Canadian stations, working with Great Britain and Australia, will be the first of the Imperial chain of stations to be ready for service.

Wiring Under Difficulties.—A correspondent in South Africa, bewailing his remoteness from up-to-date manufacturers and contractors, says:—"I study your advertisements each week with envy, and write round to firms and agencies in the Union, but can never get any satisfactory replies. In fact, we can get nothing but the old things, and the contractors are absolutely ignorant of any methods of wiring but the stereotyped enamelled steel or galvanised tubing laid along the walls, and above or below the ceilings, varied occasionally by Kaleeco or Helsby sheathed wiring made very conspicuous; all with 3½-in. round recessed wood blocks, on which the fittings—the good old brass-cover tumbler switches (very poor type at that), and porcelain dome ceiling roses—are regularly mounted.

"And the buildings here are not built of good brick, nor is cement used for mortar. The bricks are generally of mud and the mortar is what is known as 'dagga,' a mixture of mud and clay, sometimes with straw added. No Rawlplugs or wood blocks will hold in such stuff. Brickwork mortared with dagga can always be taken apart, the dagga knocked off, and the bricks used for further building, *ad lib.*, till the bricks break or wear away.

"Four months ago I called for tenders for material for wiring an important building. The idea was to use tubing sunk in the walls where possible, with flush-type switches and plugs, the switches to interlock with the plugs. It took a month's corresponding and explaining before we received tenders for everything, and up to date nothing whatever has been heard as to the probable time of delivery of the switch boxes and sunk-type switches and plugs. The ironclad main switchgear and fuses and distribution boards have just arrived."

Our sympathies are with our correspondent; the idea of fixing accessories to mud walls is repellent. But, of course, to be unable even to obtain the accessories is worse still.

Illustrated Polyglot Technical Dictionaries.—Many of our readers will already be familiar with the earlier volumes of the Schlomann-Oldenbourg Illustrated Technical Dictionaries in English, French, German, Italian, Russian and Spanish, which were begun some years ago. A British office has now been opened with Mr. H. I. Lewenz, M.I.Mech.E., M.I.E.E., as editor and manager for the British Section assuming responsibility for the English terms and phrases contained in the dictionaries. Since the war, which naturally interrupted the work, Volumes XII, XIII, XIV and XV have been produced. They deal respectively with: Hydraulics, Pneumatics, and Refrigeration; Building Construction; Raw Materials of the Textile Industry; and Spinning—Its Processes and Products. These will be followed shortly by a volume on Weaving and Woven Materials, one on Mining, and later by volumes on Agricultural Machinery, Chemistry, Gas Engineering, &c. All the earlier volumes, commencing with Electrical Engineering, will be revised in the light of experience gained and knowledge afforded by many readers. The work is stocked by Messrs. Lewenz & Wilkinson, Ltd., 25, Victoria Street, S.W.1.

H.p. Cable Manufacture in United States.—From a paper abstracted in the *Electrical World* by Mr. R. A. Payne, which was presented before the recent convention of the Empire State Gas and Electric Association at Syracuse, N.Y., we learn something of the progress being made in h.p. cable manufacture in the States. Extensive research is being carried out by the cable companies, in co-operation with the makers of cable paper and oil refiners, on paper and impregnating oil. Wood pulp paper gives very satisfactory results so far as its electrical characteristics are concerned, but it will not generally stand up to the physical requirements necessary in handling during installation. Many grades of oil are tested to determine the type and quality that give the best results in the completed cable.

Instead of using an impregnating compound, which at normal room temperature is a solid, there is a tendency now to use a substance which is almost a fluid at this temperature, and a more complete thorough saturation is thus obtained. Resin is not so extensively used in the compound, it having been found that above 80 deg. C. the power loss with the use of resin increases very rapidly. Routine factory tests are carried out before saturation to determine the wrinkling of insulation and divergence of the sectors.

Electric Cooking at the R.A.M.—One of the latest institutions to adopt electricity for cooking is the Royal Academy of Music, to which is attached a fairly large restaurant. The apparatus has been installed by the St. Marylebone Electricity Department on a special form of hire system, and the energy is supplied by the Department. The equipment com-

The R.A.M. Electric Kitchen.

prises a "Magnet" triple-oven range, with a loading of 4 kW per oven, which is controlled by a three-heat switch; a "Magnet" steaming oven with a consumption of 6 kW and three-heat control; and two fish friers with a consumption of 5 kW per pan. The equipment, a general view of which appears in the accompanying illustration, was manufactured at the Birmingham works of the General Electric Co., Ltd. It provides between 450 and 500 luncheons and teas daily, and is giving every satisfaction.

Fatality.—A FATAL SHOCK.—The Sheffield District Coroner last week opened and adjourned for further evidence an inquest on Thomas Colston, a motor lorry driver. It was stated that the man was discharging a load in the yard at Wath Main colliery, and the vehicle came in contact with an electric wire attached to a stone crusher. When the man took hold of the winding handle to tip the lorry he received a fatal shock. Artificial respiration was tried for an hour.

New Swiss Electric Locomotives.—The Swiss Federal Railways have decided to increase the tractive power of their electric locomotives, and to this end have placed an order with the Oerlikon works for the supply of new engines. The length of the new tractor is 20 metres, and its total weight 129½ tons, including 55½ tons for the electrical equipment. The tractor for express passenger trains must be capable of hauling a load of 480 tons at 65 kilometres an hour on a slope of 10 in 1,000. On the same gradient the new tractor for goods trains must be able to haul a load of 1,400 tons at 35 kilometres an hour, and with the same weight behind it get up a speed of 65 kilometres on the level. Eighteen locomotives for goods trains and ten for passenger trains have been ordered by the C.F.F.

It is a *sine qua non* that these tractors be furnished with brakes sufficiently powerful to bring to a standstill on a given slope the load hauled by them. To ensure accuracy, a given line has been chosen—Basle-Olten-Berne—and this distance must be travelled over four times within 22 hours, a halt of 20 minutes after each run being included in this time. Furthermore, the distance must be covered, if necessary, between Basle-Olten-Berne in 2 hours 35 minutes, allowing for a stop of five minutes at Olten.

The Illuminating Engineering Society.—VISITS TO LIGHTING INSTALLATIONS.—Two interesting visits were made by 70 or so members of the above society on Wednesday, February 18th. Meeting at the Army and Navy Stores, Victoria Street, the party was escorted throughout the whole of the extensive premises under the guidance of one of the engineering staff, and afterwards was conveyed to the premises of Messrs. Selfridge & Co., Ltd., in Oxford Street, to make a similar tour of inspection.

After an excellent tea provided by Messrs. Selfridge & Co., a discussion took place in which the managerial and engineering staff of Selfridge's took part.

Equipment Wanted at the University of British Columbia.—H.M. Trade Commissioner at Vancouver (Mr. L. B. Beale), reports that the construction of the new buildings for the University of British Columbia, Vancouver, has now reached the point where the authorities are desirous of giving consideration to the equipment of the various laboratories. Dr. H. Vickers, Professor of Electrical Engineering of the University, has prepared a preliminary list of equipment suggested for the Electrical and Mechanical Laboratories, which includes the following:—One 5-ton overhead crane, hand operated; testing machines for strength of materials tests; hardness testing machines; torsion machines; cement testing machines; pumps; injectors, and other suitable apparatus. Dr. Vickers intends wherever possible to install British made equipment in the laboratories connected with his Department, and would be glad to hear from any United Kingdom firm interested. United Kingdom firms in a position to offer British materials can receive further particulars regarding this possible opening on application to the Department of Overseas Trade, 35, Old Queen Street, S.W.1, quoting reference A.X. 1752.

The Batti-Wallahs' Society.—The annual dinner of this Society will be held at the Hotel Cecil on Wednesday, March 18th, at 7 for 7.30 p.m. sharp.

The World Power Conference.—The Swiss Electro-Technical Association lately held a meeting in Berne, when Dr. Tissot, the president, gave an interesting account of the proceedings at the World Power Conference at Wembley in July last year. In the subsequent discussion the suggestion was put forward that the World Power Conference in 1926 should be held in Basle on the occasion of the holding of the International Shipping and Water Utilisation Exhibition, particulars of which were given in a recent issue.

The Lighting of Llandaff Cathedral.—MESSRS. SIEMENS AND ENGLISH ELECTRIC LAMP CO., LTD., inform us that the carrying out of this work, which was described in our last issue, should have been attributed to Messrs. Angus Scott and Partners.

New Signalling System on the Southern Railway.—The Southern Railway Company announces its intention of spending £182,000 upon the provision of a new light signalling system to work in conjunction with the electrified lines which are shortly coming into service. The system will employ three colours with four "positions," being somewhat similar to the system in use on the Underground railways.

A Report upon the Sydney Electricity Undertaking.—In our issue of February 13th (p. 265) we briefly summarised Mr. S. L. Pearce's report to the Sydney (N.S.W.) City Council after a first-hand investigation of that Council's electricity supply undertaking. The principal recommendations were that the Council should continue to receive electricity in bulk from the Railway Commissioners and not build a new generating station.

According to the *Industrial Australian and Mining Standard*, the Municipal Council intends to disregard Mr. Pearce's advice, to terminate its contract with the Railway Commissioners in 1930, and proceed with the erection of a new power station. The Lord Mayor recently gave as the reason for this decision, the fear that if the Railway Commissioners needed all the current generated by them, the city would have to go short. The Council wishes the city to be independent of any external authority in the matter of electricity supply.

Appointment Vacant.—Assistant meter superintendent for Edinburgh Corporation Electricity Supply. (See our advertisement pages to-day.)

Women's Electrical Association.—A visit has been arranged to the Osram Lamp Works, Hammersmith, on Monday, March 16th, at 2.30 p.m., by the London branch of the Women's Engineering Society, and members of the Women's Electrical Association are also taking part.

The L.C.C. and Supply Undertakings.—The agenda for last Tuesday's meeting of the London County Council contained notice of the following motion by Mr. Morrison:—"That having regard to the offer to bring the date of public ownership forward to 1941, known to have been made by the electricity supply companies last year, it be an instruction to the Parliamentary Committee to take all possible steps to secure the inclusion in the London Electricity Supply (No. 1) Bill and the London Electricity Supply (No. 2) Bill of a provision enabling the contemplated Joint Electricity Authority to acquire the undertakings in 1941, instead of in 1971, and at intervals of ten years after 1941."

L.M.S. Electrical Rolling Stock and Power Stations.—The report of the London, Midland & Scottish Railway Co. for the past year shows that at the end of 1924 the company still had two electric locomotives in service. The number of motor coaches was 272, one less than at December 31st, 1923. The number of trailer coaches remained the same, 353. The number of train miles worked electrically increased from 5,217,235 to 5,472,820. A total of £97,368 was spent in connection with the company's power stations during the year. This was divided as follows:—Derby, £32,312; Formby, £49,770; Stonebridge Park, £9,806; other stations, £5,479. During the current year an estimated sum of £35,000 will be expended upon the Stonebridge Park station and £10,000 on other power stations.

Electrical Mining Engineers' Meeting.—In response to an invitation from its South Wales Branch, the Association of Mining Electrical Engineers will hold its general meeting in Cardiff from June 9th to 13th next. The election of officers will take place and the following nominations have been made:—President, Mr. Theodore Stretton, M.I.E.E., M.I.Mech.E., Cardiff; Vice-Presidents, Mr. David Martin, O.B.E., Glasgow, Mr. G. M. Harvey, Birmingham University. A number of the most prominent colliery owners in South Wales will act as an honorary committee.

The Telephone Industry and Allied Industries.—In a note issued by the Telephone Development Association, the importance of the telephone industry is effectively illustrated by a long list of other industries—metallurgical, electrical, toolmaking, building, chemical, textile, rubber, &c.—whose products are employed in the creation and maintenance of a telephone system, showing that the development of the telephone service would stimulate some 50 industries, and affect every part of the British Empire. To bring Great Britain up in the list of nations arranged according to telephone density from her present position of 14th to the level of Norway, the sixth, would require the addition of 1¾ million telephone stations, at a cost of 88 millions sterling.

Efficient Filing.—A paper under the above title was read by Mr. R. Borlase Matthews, Wh.Ex., A.M.I.C.E., M.I.E.E., F.R.Ae.S., under the auspices of the Office Machinery Users' Association on February 11th. The paper dealt with improved applications of modern filing equipment for use with the accounts and costing departments of a business. A new alphabetical-decimal system of classification for correspondence was described, differing in principle from the system now in vogue. The methods that were described were those which have been in use in the author's own office for some considerable time, and the author being interested in electrical engineering, wireless, and electro-farming, reference to the classification of these subjects was made.

Electricity Control in United States.—Governor Pinchot, of Pennsylvania, has presented to the Legislature a report prepared by the Giant Power Survey Board on the future of electricity in the United States. According to the *Daily Mail*, electric power in that country, he states, is already "a gigantic monopoly without parallel in the history of the world." The chief feature of his programme of regulation of the industry is to make transmission companies common carriers, compelled by law to accept all current offered to them and to sell it to all who offer to buy it at reasonable rates. The transmission companies would be prohibited from producing power. Governor Pinchot favours large-scale production of electricity at the sources of the coal and water supply by private capital, and its transmission to the centres of distribution. It is proposed to authorise the construction by generating companies of plant of "not less than 300,000-kilowatt capacity in coal areas."

Railway Electrification in India.—BOMBAY SUBURBAN SYSTEM.—In the account last week of the above electrification scheme BRITISH INSULATED & HELSBY CABLES, LTD., were credited with having supplied the necessary track bonds. We understand, however, that in addition this company designed and carried out the whole overhead equipment. All steel masts, bridges, &c., were designed at the Prescot works, manufactured by Messrs. Francis Morton & Co., Ltd., of Garston, and erected by the B.I. & H.C. contract staff. All the overhead equipment embracing fittings, contact wire, stranded cables, high-pressure transmission wires and their supports was designed and manufactured entirely at the Prescot works and erected by the company's own staff.

Institution Notes.

Institution of Electrical Engineers.—ASSOCIATE MEMBERSHIP EXAMINATION.—The Council of the Institution has decided to accept in lieu of Part I of the A.M.I.E.E. Examination the Higher Grade National "Certificate" or "Diploma" in Electrical Engineering, provided the candidate satisfies the Institution in the subject of "English Essay."

WIRELESS SECTION.—The arrangements for the remainder of the current session include the following items:—

March 4th.—"Current Transformer Methods of Producing Small Known Voltages and Currents at Radio Frequencies for Calibrating Purposes," by Mr. D. Dye.
"The Measurement of Frequency and Allied Quantities in Wireless Telegraphy," by Lt.-Col. K. E. Edgworth and Lieut. G. W. N. Cobbold.
April 1st.—"The Leafield Coupled Arc," by Major A. G. Lee and Mr. A. J. Gill.

Junior Institution of Engineers.—On February 6th Mr. E. G. Herbert delivered a lecturette on "The Measurement of Hardness and Allied Properties of Metals." Mr. Herbert described a hardness testing machine, which takes the form of a pendulum. In this machine a hardened steel ball is mounted in the centre of an arched bar of metal in such a position that it is almost exactly at the centre of gravity of the machine. If the instrument is placed so that the ball rests on any plane surface and then slightly tilted, it will rock from one side to the other with a pendulum motion. By means of a spirit level and a scale mounted on the instrument, the angle of tilt can be read. The instrument was described in our issue of April 20th, 1923 (p. 638). Mr. Herbert illustrated his talk with many remarkable slides reproduced from micro-photographs, which showed the nature of the depression made by the instrument. Some of the slides showed sections of the metal that had been subjected to work hardening by the rolling action of the ball, and from these some curious deformations of the structure of the metal were observed, which, as Mr. Herbert said, could form the basis of a great deal of investigation.

On February 13th Mr. Loughnan Pendred, M.I.Mech.E., delivered the Honorary Member's Lecture, which was entitled "Milestones in the Development of the Prime Mover Locomotive." Mr. Pendred showed a number of slides, there being an illustration of nearly every distinctive type of locomotive from the earliest to the most modern, including steam turbine and internal-combustion engine locomotives.

The programme of the North-Western Section for the month of March includes the following papers:—

March 2nd.—"Power Factor Improvement," by Mr. G. H. Ayres.
March 16th.—"Industrial Electric Vehicles," by Mr. J. R. Oliver.
March 30th.—Informal meeting and election of chairman.

An interesting discussion on the subject of "Inverted Tooth Chain Drives" followed a lecturette delivered by Mr. J. M. Seddon, A.M.I.E.E., on Friday, February 20th. Opinions were expressed as to when a chain drive would be more suitable than a belt drive. Mr. H. V. Pointon said that in many cases he had found that the cost of a chain and two pinions was less than that of a belt and two pulleys. But Mr. Seddon pointed out that a chain drive should be designed with reasonably short centres from considerations of weight, which for a 3 in. pitch chain was about 40 lb. per foot length. A long drive was not a case for a chain. Mr. F. E. Squirrel inquired if the slack side should be at the top or bottom, and also suggested that tooth chains were liable to become clogged in dusty atmospheres. Mr. Seddon said with very short centres and a very big reduction it was better to have the slack side at the bottom, to avoid sticking. Dust would be a nuisance unless the chain were cased in. Mr. Seddon said that the rocker pins were case-hardened till they were almost glass hard, then the ends were softened to allow riveting when in position. Sprocket wheels, which were made either of hardened steel or cast iron, would outlast two or three chains. It was not very good practice to put new chains on old sprockets, the wear on the teeth was very little, and therefore it was not necessary to increase the pitch when renewing a chain.

Institution of Heating and Ventilating Engineers.—Mr. A. H. Barker, B.A., B.Sc., in a paper read at the annual meeting on February 11th, entitled "Unknown Factors in Heating and Ventilation," said the most important portions of the unexplored field of heating and ventilation related to the working properties of the materials and plant employed, such as building materials, radiators, boilers, pipes, fittings, fans, air ducts, and the like, and to the results produced by the plant. Mr. Barker outlined what had already been done in the way of research as regards heat losses through building materials, heat transmission from radiators, effect of different paints and coverings, and the analysis of the emission by radiation and convection. Turning to ventilation, he emphasised the necessity of investigation as to the friction of air in ducts and fittings, as he ventured to say no one ever found the actual deliveries anywhere near the calculated values. In general terms, the essence of the problem was to determine the physical effect of different heating appliances on the thermal conditions of a room, and of the latter in turn on the comfort of the human being in the room. Until they had arrived at the stage when they could define the thermal condition of a room accurately, they certainly could not say how much radiated or convected heat was wanted, even if they could measure it. This was, in his view, the very root problem underlying the whole science of heating and ventilation, and until it was solved one could not call heating engineering a real science, nor could anybody call himself a real expert in either the one or the other.

SMOKE ABATEMENT.—"We have arrived at a period when fuel is expensive and from which there seems no likelihood of immediate relief," said Mr. Alcwyn A. Jones, in his presidential address before the Institution of Heating and Ventilating Engineers. This, he stated, meant that every consumer was anxious to use any means of making each ton of coal go further than it did in days gone by. Consequently, central heating had made rapid advances in recent years. It must occur to all, when thinking of the problem, that the heating engineer had a mission to perform in that direction. Soot produced by domestic fireplaces was an immensely expensive product when considered in relation to the material damage done by it. The waste of fuel in cooking and house heating had been estimated at three-quarters of that used. Smoke abatement was continually referred to in the Press and elsewhere, but he would like to see heating engineers taking a larger share in the publicity and cure of this great public nuisance. The public had many panaceas for the evil brought to their notice, but it might be further impressed upon the public that central heating and hot-water supplies utilising smokeless fuel, such as coke, would save enormous sums for raw coal, which were at present borne by the community. The education and enlightenment of the public was better than legislation, and it was probable that the Institution could do more than it was doing at present to assist in this work.

Société des Ingénieurs Civils de France.—BRITISH SECTION.—In his presidential address to the British Section of the Société des Ingénieurs Civils de France, Mr. L. A. Legros, O.B.E., M.Inst.C.E., M.I.Mech.E., M.I.E.E., spoke on "Skill in Relation to Production." He referred to the effects of standardisation and mass production in eliminating individual skill. Attempts to reduce skill had not eliminated the necessity for skill in allied work.

He said that employers had done harm in the past by judging the efficiency of a worker by the way he hustled over his work; they had mistaken hustle for efficiency; also in putting a limit to a man's earnings. Trade unions had done equal harm by ignoring the differences that existed between different workers and allowing time workers to be slowed down to the slowest worker. So long as the employé was paid by time and the employer by piece it was improbable that any indication of the future prospects of the skilled worker could be given. Conditions demanding great skill produced nervousness, and a worker could not proceed with delicate work when a stranger or a director was about. The alternative to the decay in trade rested with the trade unions, and hope of industrial peace could only be justified if the skilled worker was permitted to earn higher wages than the unskilled worker.

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

At an official "tea," which was held in the Town Hall, Manchester, yesterday (Thursday) evening, Mr. S. L. PEARCE was welcomed on his return from Australia, and his completion of 21 years' service as chief engineer of the City's Electricity Department was recognised.

The Parliamentary Committee of Southampton Town Council has recommended that the salary of the tramway manager and engineer be increased from £700 to £800 per annum.

Mr. H. E. MUNDAY, A.M.I.E.E., has resigned his position as charge engineer at the Hylton Road power station of the Worcester Corporation to take up an appointment with the Burton-on-Trent Electricity Department. The staff and employés of the Worcester undertaking presented him with a clock.

The Glasgow Corporation Electricity Committee has appointed Mr. JOHN SIMPSON, cost and works accountant, as chief clerk, at a commencing salary of £500 per annum, without bonus; and Mr. ANGUS M'LEOD as cost and works accountant, at a commencing salary of £325 per annum, without bonus.

Mr. H. S. ASPINALL, general manager of Vickers-Petters, Ltd., has been appointed a director of the company. Early in 1923 Mr. Aspinall resigned his position as sales manager and director of the Keighley Gas and Oil Engine Co. to take up the position of sales manager to Vickers-Petters, Ltd., and in July, 1924, was appointed general manager of the company.

The Burton-on-Trent Town Council has resolved to increase the salary of its electrical and tramway engineer by two increments of £50 each to £1,000 per annum. The salary of the tramway manager is being increased to £525 per annum.

Croydon Corporation Electricity Committee recommends that the salary of Mr. A. C. CRAMB, borough electrical engineer, be increased from £1,200 to £1,400 per annum.

The *Industrial Australian and Mining Standard* states that Mr. W. H. MYERS, who held the position of chief assistant electrical engineer of railways in New South Wales, has been appointed chief electrical engineer for railways and tramways in succession to Mr. BRAIN, who recently was appointed Assistant Railway Commissioner.

The Rochdale Gas and Electricity Committee recommends that the salary of Mr. F. H. RUDD, borough electrical engineer, be increased from £800 to £900 per annum.

On February 19th the marriage took place at the Society of Friends' Meeting House, Gloucester, of Mr. GEORGE NORMAN CADBURY, chairman of the Electro-Mechanical Brake Co., West Bromwich (a son of the late Mr. George Cadbury), and Miss CELIA JEANETTE SOUTHALL, of Newent, Gloucestershire.

Mr. NEWCOMB CARLTON, president of the Western Union Telegraph Co., is on a visit to this country in connection with the laying of a new cable between this country and the United States.

Mr. E. HARLAND HUTCHINSON, who has for many years specialised in burning coal in pulverised form, has accepted an important executive position with Vickers & International Combustion Engineering, Ltd. He will have charge of developments of the company's interests in the Dominions and Colonies, and is shortly proceeding to Australia, *via* the United States and Canada.

Mr. WILLIAM OLIVER, B.Sc., who has been appointed to be the first occupant of the Chair of the Organisation of Industry and Commerce at the Edinburgh University, was at one time associated with Messrs. Bruce Peebles & Co., Ltd., Edinburgh, holding the position of manager of the sales and contract department. He is now a director of Messrs. Mitchell, Graham & Son, Ltd., engineers, Edinburgh.

The Bedford Electricity Committee has appointed Mr. N. FLEMING as assistant station superintendent.

Mr. C. E. ALLSOPP, of the Bradford Corporation Electricity Department, and Mr. HARRY MOSS, have been elected members of the Executive Committee of the Bradford Publicity Club.

Messrs. ALEX. W. LAMOND and F. S. SMITH, who have been connected with Messrs. J. & W. B. Smith, Ltd., of Farringdon Road, E.C., for many years and are well known in the lighting trade, have been elected to seats on the board of the company.

Obituary.—MR. D. BROWNING.—The death took place on February 12th of Mr. David Browning, who had for 28 years been on the electrical staff of the London, Brighton & South Coast Railway at Newhaven Harbour.

Mr. L. FERENS.—The death occurred on February 19th of Mr. Lionel Ferens, an electrical engineer with Messrs. Reid, Ferens & Co., of Newcastle-on-Tyne. Mr. Ferens, who was only 22 years of age, was the son of Alderman and Mrs. Ferens, of Fernhill, Durham.

New Companies Registered.

Northumberland and Durham Radio Engineering Co., Ltd. (203,864).—Private company. Registered February 16th. Capital, £1,000 in £1 shares. To carry on the business of manufacturers of, and dealers in instruments, apparatus, accessories, and materials used in connection with radio or wireless telegraphy and telephony, &c. The permanent directors are:—W. Walton, 5, Belgrave Crescent, Blyth, gent.; Mrs. J. C. Walton, 66, Park Road, Newcastle-upon-Tyne. Qualification, £25. Remuneration, £10 per annum divided between them. Solicitor: T. V. Devey 88, Westgate Road, Newcastle-upon-Tyne.

Plessey & Co. (1925), Ltd. (203,848).—Private company. Registered February 14th. Capital, £20,000 in 16,000 8 per cent. preference shares of £1 each and 80,000 deferred shares of 1s. each. To adopt an agreement with Plessey & Co., Ltd., and to carry on the business of manufacturers of electrical and scientific apparatus, electricians, electrical engineers, and manufacturers of all kinds of electrical machinery and apparatus, manufacturers of, and dealers in accumulators, lamps, meters, engines, dynamos, batteries, telephonic or telegraphic apparatus, &c. The first directors are:—C. T. Bazell, Marconi House, Strand, W.C.2; H. Morgan, Capel House, New Broad Street, E.C.1; A. Clark, Vicarage Lane, Ilford; W. O. Heyne, Vicarage Lane, Ilford. The last two named are joint managing directors. So long as the Marconiphone Co., Ltd., or its nominees hold more than 50 per cent. of the issued deferred shares, it may have three nominees on the Board so long as the total number of directors does not exceed five, and four nominees when the total number of directors is six. C. T. Bazell and H. Morgan are two of the first nominees. Remuneration, £100 each per annum (chairman £150), all free of income tax. Solicitors: Steadman, Van Praagh & Gaylor, 4, Old Burlington Street, W.1. Registered office: Marconi House, Strand, W.C.2.

Austin Lighting Co., Ltd. (203,954).—Registered as a private company on February 19th, with a nominal capital of £50 000 in £1 shares. The objects are: To carry on the business of manufacturers of, agents for and dealers in all kinds of electrical machinery, plant, switchgear, apparatus and supplies, and cables, agricultural plant, implements, machinery, tools and appliances, contractors for the generation and application of electric energy, for tractive or motive power or with a view to augmenting or accelerating the growth of crops; motor car, motor lorry and tractor proprietors, haulage contractors, &c. The number of directors is not to be less than three nor more than nine. The first are:—Sir Herbert Austin, Lickey Grange, Bromsgrove (chairman, Austin Motor Co., Ltd.); H. T. Day, Hazel Grove, Stockport (sales manager of Mirrlees, Bickerton & Day, Ltd.); W. C. Lusk, Crown House, Aldwych, W.C. (managing director of British Thomson-Houston Co., Ltd.); R. B. Matthews, Greater Felcourt, East Grinstead, consulting engineer; T. Petersen, Hamilton House, Victoria Embankment, E.C. (joint manager of Callender's Cable & Construction Co., Ltd.); C. B. Walker, 16, Bloomfield Road, Moseley, electrical engineer. The said R. B. Matthews may retain office so long as he holds 500 shares, and the said C. B. Walker shall continue to be a director for the term of his managing directorship. Qualification, 500 shares. Remuneration as fixed by the company. Solicitor: A. R. Monks, Crown House, Aldwych, W.C.

Horley Manufacturing Co., Ltd. (203,840).—Private company. Registered February 14th. Capital, £1,000 in £1 shares. To carry on the business of manufacturers and repairers of, and dealers in all kinds of electric or gas lamps, wire, electric bells and wireless instruments, electrical machinery and other electrical or gas apparatus for lighting, listening, heating, power or ventilation, and all kinds of wireless apparatus and accessories, &c. The first directors are:—C. R. Billyard-Leake, 60, Knightsbridge, S.W.; W. M. Rogerson, "Easton," Wembley Park Drive, Wembley (director and works manager of Stella Lamp Co., Ltd.); C. H. Horwood, address not stated. Qualification, 50 shares. Remuneration, as fixed by the company. Secretary: G. F. Bye. Solicitors: Blyth, Dutton, Hartley & Blyth, 112, Gresham House, E.C.2.

Presspahn, Ltd. (203,946).—Private company. Registered February 19th. Capital, £1,000 in £1 shares. To carry on the business of manufacturers, exporters and importers and factors of, contractors for and dealers in presspahn, press paper and boards, fuller boards, insulated paper and cardboard, india-rubber goods, mica, micanite, ebonite and vulcanite and all forms of and articles made from paper or pulp and materials used in the manufacture or treatment of paper, including card and mill boards, wall and ceiling papers, &c. The subscribers (each with one share) are:—T. E. Gardner, Springfield, Allerton, Bradford, chartered accountant; A. C. Clad, Ashgrove, Menston, near Leeds, paper merchant. The subscribers are to appoint the first directors. Qualification, £50. Remuneration as fixed by the company. Solicitor: C. A. Payne, Hope Buildings, 171, Sunbridge Road, Bradford.

Monmouthshire Electrical Engineering and Supply Co., Ltd. (203,862).—Private company. Registered February 16th. Capital, £500 in £1 shares. To carry on business as indicated by the title. The subscribers (each with one share) are:—A. E. Davies, 24, Western Mail Chambers, Cardiff, accountant; H. Beaumont, 5, Piercefield Place, Cardiff, clerk. The first directors are to be appointed by the company or subscribers. Qualification, £50 shares. Remuneration as fixed by the company. Secretary: A. E. Davies. Registered office: 24-25, Western Mail Chambers, Cardiff.

Electrical Contracts and Maintenance Co. (1925), Ltd. (203,903).—Private company. Registered February 18th. Capital, ££3,000 in £1 shares. To carry on the business of electricians and providers of electricity, &c. The first directors are:—M. J. Wells, 90, Nightingale Lane, S.W.12; F. A. Fraser, 11, Barnstaple Road, Thorpe Bay, Essex. Qualification, £50 shares. Remuneration, £100 per annum divided between them. Solicitors: Ward, Bowie & Co., 7, King Street, Cheapside, E.C.

Official Returns of Electrical Companies.

B. Barnett (Electrical Engineers Leyton), Ltd.—F. Loveridge, of 47, Ratcliffe Road, Forest Gate, E.7, electrician, was appointed receiver and manager by order of Court dated January 30th, 1925.

C. H. Hare & Son, Ltd. (110,911).—Return dated December 31st, 1924. Capital, £20,000 in 9,000 ordinary and 11,000 preference shares of £1 each. 8,600 ordinary and 11,000 preference shares taken up. £12,102 paid. £7,498 considered as paid. Mortgages and charges, nil.

Wholesale Electrical Co. (1922), Ltd.—G. Farquhar, of Pinnacle Works, Weybridge, was appointed receiver and manager on February 3rd, 1925, under powers contained in debentures registered December 28th, 1923.

Dispatch Engineering Co., Ltd.—H. T. Bloor, of 255, Finsbury Pavement House, E.C.2, ceased to act as receiver or manager on July 21st, 1924. (Notice filed February 11th, 1925.)

E. A. Brown & Co., Ltd.—Mortgage dated January 1st, 1925 (but executed January 28th, as per statutory declaration), to secure £450, charged on leasehold land and premises in Brown Street, Collyhurst, Manchester, and known as Collinghurst Wire Works. Holder: T. R. Little, 23, Orchid Street, Harpurhey, Manchester.

Ebonite Container Co., Ltd.—Charge on the company's undertaking and property, present and future, including uncalled capital, dated January 20th, 1925, to secure £1,500. Holder: W. E. Smith, 39, Lombard Street, E.C.3.

Orling's Telegraph Instruments Syndicate, Ltd.—Issue on January 31st, 1925, of £175 debentures, part of a series already registered.

C. T. Briscoe & Son, Ltd.—Satisfaction in full on January 29th, 1925, of mortgage dated July 10th, 1923, securing £1,000.

Siemens Brothers & Co., Ltd.—Satisfaction to the extent of £28,000 on January 1st, 1925, of debenture stock dated January 15th, 1918, securing £1,330,000.

Weaver Tidal Power Syndicate, Ltd.—Trust deed dated February 11th, 1925, to secure £30,000 7 per cent. debenture stock, charged on the company's undertaking and property, present and future. Trustees: Keystone Investment Trust, Ltd., Parr's Bank Chambers, Kingston-on-Thames.

Hills Wireless Stores, Ltd.—Debenture dated February 11th, 1925, to secure £400 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. R. Hooker, 39, Warwick Avenue, Maida Vale, W.9.

Liverpool Electric Cable Co., Ltd. (71,099).—Return dated December 26th, 1924. Capital, £30,000 in £1 shares. All shares taken up. £7,833 paid. £22,167 considered as paid. Mortgages and charges, nil.

Yale Electric Power Co., Ltd. (60,493).—Return dated November 11th, 1924. Capital, £20,000 in 3,300 preference shares of £1 each and 668 ordinary shares of £25 each. 300 preference and 668 ordinary shares taken up. £15,300 paid on 600 ordinary and 300 preference shares. £1,700 considered as paid on 68 ordinary shares. Mortgages and charges, £5,505 10s. 9d. (bank overdraft).

City Notes.

The "Underground" Group.

The annual meetings of the companies of this group were held jointly on February 19th, Lord Ashfield presiding. In presenting the reports and accounts, which were reviewed in our last issue, the Chairman said that although the volume of traffic as a whole had increased, the results had been less advantageous. This was explained by the fact that the whole of the additional traffic had gone to the omnibuses. On the other hand, the traffic of the underground railways had declined, but in spite of this it was not possible to reduce the services, and thereby lower the working expenses. Consequently the Common Fund had been reduced by £182,258 from the 1923 total. It was anomalous that while the traffic of Greater London continued to expand, those providing the means of transport could not secure a reasonable return upon their capital. This was especially noticeable in the case of the tramways. The adverse factors operating during the year had increased the aggregate operating expenses by £897,000, and reduced the net receipts by £247,000. While the traffic receipts had risen 5 per cent., the cost of operating the systems had increased by 11 per cent. In 1922 the companies embarked upon a capital expenditure of over £6,000,000; while this policy helped to relieve unemployment and restore trade, it also proved the right course to take to strengthen the position of the "Underground" system. Everything possible was being done to expedite the traffic and increase the convenience of the service to the public. Among other things the central overhaul works at Acton were commencing to show beneficial results in improved train running and lowered costs, and plans were being proposed for their extension. Application was being made to the Minister of Transport for power to construct a short connecting line at King's Cross, between the City and South London Railway and the Piccadilly section of the London Electric Railway, so that the rolling stock of the Hampstead and City lines might also be taken to Acton for overhaul and a further centralisation take place. The whole stores organisation of the companies had been recast and brought under single control. All these improvements were carried out with the hope of reward, and if that reward were denied the time had come when they must stay their hand. Until the heavy expenditure recently incurred became self-supporting by attracting additional traffic they could not possibly venture upon any fresh outlay. They would, for a time, have to adopt a conservative policy. They were being urged to extend their system in several directions. There were several urgent requests from South-East London. There was a keen inquiry in Ilford and Becontree, where the London County Council was laying out a new town. Particularly, there was a demand for an extension of the Piccadilly Section northwards from Finsbury Park. These were but a few of the projects which deputations had recently laid before the Minister of Transport and the companies.

To all these projects they had to turn a deaf ear. Not that many of them were not desirable and needful, but if London hoped to secure the execution of those projects it could only be as a part of a considered scheme in which the various means of transport were co-ordinated and destructive competition was brought within reasonable limits. If and when such a time arrived they would be happy to go forward, for no one realised more than they the danger and difficulty of a policy of stagnation.

Turning back to the costs of operation, Lord Ashfield said that salaries and wages constituted 59 per cent. of the total expenditure in the case of the railways and 63 per cent. in the case of the omnibuses, so that they represented an effective field for possible economies. So far they had kept to a practice of friendly negotiation in this matter, and they hoped that this would continue unbroken. In the last resort the choice must ultimately rest between either the acceptance of lower salaries and wages in order to continue in employment, or a shrinkage of employment. At the moment they were confronted by the railwaymen with a demand for improved conditions and pay which would add £750,000 to the yearly wages bill. Out of what resources could they meet it? The results for the past year revealed none. The omnibus workers, too, had made a claim for higher wages. Unless the present conditions altered considerably they would have to contemplate asking the employés to surrender some of the terms which they now enjoyed.

Lord Ashfield then dealt at some length with the London Traffic Act, 1924, in its application, particularly, to the London General Omnibus Co. He trusted that the control exercised would not merely be a policy of restriction and limitation.

After reviewing the accounts of the companies the Chairman said that the dividends were maintained with the exception of that of the London General Omnibus Co. The Underground Electric Railways Co. of London, Ltd., also maintained the distribution to its bondholders at the same level. The amounts transferred to the reserves had been reduced, and the sums carried forward were lower.

The reports and accounts were adopted.

North Metropolitan Electric Power Supply Co.

The net revenue for 1924 was £272,483 (£223,435 for 1923), plus £6,210 brought forward. This is dealt with as follows: Mortgage, debenture stock, and other interest, £33,177; reserve fund for 5 per cent. mortgages, £2,000; to reserve, £132,718; 6 per cent. preference dividend, £35,999; 8 per cent. second preference dividend, £20,000; 10 per cent. on the ordinary shares, £47,502; carried forward, £7,297. New capital expenditure mainly upon plant, machinery, and mains amounted to £358,870. The power stations at Hertford and St. Albans were interconnected during the year with the Brimsdown power station. A supply of electricity was commenced in March, 1924, at Waltham Abbey, and in October at Harow Weald and Stanmore. Total kWh sold 96,500,000 compared with 78,500,000 for 1923, an increase of 23 per cent. Total number of consumers supplied, either directly or indirectly, 45,500, an increase of 8,500.

Electrical Distribution of Yorkshire, Ltd.

The net profit for 1924 was £25,619, against £19,233 for 1923. Including £6,644 brought forward, there is £32,264 available, as compared with £22,774 last year. It is proposed to pay 7 per cent., free of tax, on the ordinary shares, to put £8,000 to reserve, and to carry forward £10,838. There has been a continuous and growing demand for electricity, and the directors have further reduced prices in all districts. During the year the company has been authorised by Special Orders to supply in: Burley-in-Wharfedale and district; Gildersome and district; Guiseley and Yeadon; Kirkheaton and district; Mytholmroyd, Colne Valley and district; and South Yorkshire. The company has now been granted powers to supply under 31 Electricity Orders with an area of over 650 square miles, and a population of 556,750. The company is actually supplying in all these areas. Considerable extensions of mains have been made; the new connections made are substantially larger than in any year since the formation of the company. A large amount of work is in progress in all areas to supply additional demands.

Tyneside Tramways and Tramroads Co.

At the half-yearly meeting held at Newcastle-on-Tyne on 17th inst., Mr. G. E. Henderson, who presided, said that the traffic receipts for the whole year showed an increase of £431. The mileage run and the number or passengers carried showed slight increases, but the working expenses were also up by £643, and the gross profits were somewhat less. Expenditure on the renewal of the permanent way totalled £2,000, which had not been met entirely out of revenue account. After provision of a dividend of 5 per cent., less tax, on the preference shares, and for the necessary reserves, there could be no ordinary dividend. The conditions in the shipbuilding and engineering industries had scarcely improved. Workmen employed in those industries were their main source of revenue, and they could not look for any great increase of traffic receipts until there was an improvement. Until the workmen were prepared to take smaller wages and work harder, there was not much chance of a brighter outlook for the company.

London Electric Supply Corporation, Ltd.

The profit for 1924 is £164,863, against £154,452 for 1923. After including £33,251 brought forward, and £1,053 interest, and deducting £2,505 expenses of issue of new preference shares, £196,641 is available. Out of this debenture interest and sinking fund absorb £40,074; 6 per cent. preference dividend, £34,452; and 10 per cent. dividend on the ordinary shares, £49,830; £15,000 is put to reserve; £20,000 to depreciation; £5,000 to contingencies; and £32,285 is to be carried forward. The sinking fund for the redemption of debenture stock in 1931 now amounts to £242,523, in addition to £81,364, a total of £323,887. Units sold, 61,809,968, as against 52,819,491 in 1923, an increase of more than 17 per cent.; average receipt per unit sold, 1.56d., as compared with 1.69d. in 1923. The report states:—

> The Bill referred to last year as having been lodged in Parliament by the London Electricity Joint Committee (1920), Ltd., was passed last Session by the House of Lords. . . . It has since been read a first time in the House of Commons, and will, it is hoped, proceed at an early date.
>
> Provisional agreements dealing with the generating stations were entered into by the Joint Committee with this company and the other constituent companies, and these agreements were scheduled to the Bill with an agreement which that Committee Company was able to arrange with the London County Council.
>
> The Electricity Commissioners have made their order and scheme setting up an Electricity Authority for the London and Home Counties Electricity District as contemplated by the Bill, and the agreements referred to above, and this Order is now before the Minister of Transport for confirmation.

The directors ask the shareholders to authorise them to take any further steps which they may consider desirable in the shareholders' interests in connection with the Bill and scheme (which are interdependent).

Metropolitan Railway Co.

Lord Aberconway presided at the annual meeting on February 19th, and in moving the adoption of the report and accounts (*vide* our last issue, p. 307), he said that during the year the company had erected and equipped three new sub-stations. The traffic receipts showed an increase of £383,000, due mainly to the British Empire Exhibition. The ratio of expenditure to receipts fell from 69.2 to 64.9 per cent. Parcels traffic improved, but merchandise traffic experienced a small decline.

The company was in a strong financial position, the amounts put aside for depreciation, renewal, emergency, and other purposes totalling nearly 1½ million pounds. There had been a decided increase in the company's long-distance traffic, but a great deal of the short-distance traffic was being lost to the omnibuses.

The extension of the company's electrification to Rickmansworth added about eight route miles to the electrified part of the system; the work was done in pursuance of the company's policy of gradually extending the electrification as the increase in traffic justified it. The dividend might have been higher, but it was considered desirable to further strengthen the company's position.

Torquay Tramways Co., Ltd.

The profit for the past year was £36,216, and after deducting debenture interest and sinking fund, and adding £2,644 brought forward, there is a balance of £32,260, which is distributed as follows:—Reserve and renewals, £13,029; reserve for equalisation of dividends, £1,000; income tax provision, £4,600; depreciation, £131; final dividend of 4 per cent. and a bonus of 1 per cent., both free of tax (making 9 per cent. for the year); leaving £2,701 to be carried forward. The gross revenue increased from £67,400 to £70,548, and the number of passengers carried from 7,390,236 to 7,796,224. Two new cars were put into service, and two more have been ordered. The Devon General Omnibus & Touring Co., Ltd., also showed satisfactory progress.

Lancashire United Tramways, Ltd.

The traffic receipts during 1924 (including those from the motor services) were £234,514. To this was added £37,246 from electricity sold, &c., making £271,760. Working expenses, general charges, &c., amounted to £213,917, leaving a gross profit of £57,843, a little greater than that of the previous year. The amount received from the operating company was £116,531, and after meeting expenses, including prior lien debenture interest, and paying interest at 5 per cent. on the second mortgage debenture stock, a balance of £1,604 is transferred to the depreciation account. There was also a balance of £18,825 on the year's working of the operating company.

Marconi's Wireless Telegraph Co., Ltd.

In our last issue we reported that the company was issuing 500,000 ordinary shares of £1 each at 27s. 6d., present shareholders having the prior right to them. We have received a circular letter from the company, addressed to the shareholders, explaining the reasons for the issue. The prospects held out by the "beam" system of directional radio-telegraphy are such that agreements have been entered into for the construction of stations in this country, Canada, South Africa, Australia, and India—so far as Empire communication is concerned. In addition, the Portuguese Government is adopting the system for long-range communication. The sources of the company's income are set forth, and it is stated that progress is being made in all branches. It is anticipated that the expenditure which is being made will be fully justified by results, and will be productive of revenue in a short time. Incidentally, it is mentioned that the company's claim for services rendered to the Post Office during the war has been settled, an outstanding amount of £127,609 having been received.

Power Securities Corporation, Ltd.

The annual meeting of this company was held on February 17th, under the chairmanship of Mr. G. Balfour, J.P., M.P. In moving the adoption of the report and accounts (ELECTRICAL REVIEW, February 13th, p. 269), the Chairman said that the results of the company's work during 1924 were satisfactory. A number of projects had been investigated, and would probably develop into active business at a later date. During the year the company had increased its interests in the syndicate owning the powers to develop the Grampian Hydro-Electric Co. Plans for the commencement of construction were well advanced. The company had also assisted in the development of a number of electricity supply undertakings by financial support. The business of Balfour, Beatty & Co. continued to expand, and a fair volume of construction business was being carried out in Argentina and Uruguay. The report and accounts were adopted.

Clyde Valley Electrical Power Co.

The directors' report for 1924 shows a a balance of profit of £272,038, to which is added £29,108 brought forward, making £301,146. Of this amount £80,000 is transferred to the contingency fund, and £38,500 to the second preference share special reserve fund (making £70,000). After the payment of preference dividends, it is proposed to declare a final dividend of 5 per cent. on the ordinary shares, making 8 per cent. for the year, as in 1923; to write off costs of capital issues amounting to £12,768; and to carry forward a balance of £63,878. In view of the increased load on the system, orders have been placed for an additional 25,000-h.p. turbo-alternator and auxiliary plant to be installed at the Clyde's Mill station. The company has acquired the powers contained in the Lanarkshire Hydro-Electric Power Bill. A commencement has been made with the works which will add 20,500 h.p. to the generating plant of the company. The power stations at the Falls of Clyde will be connected with the company's system by overhead transmission lines, from which Lanark and other districts in the south of the company's area can be economically developed. A petition has been lodged against the Glasgow Boundaries Provisional Order with a view to protecting the company's interests. Meeting: Glasgow, March 4th.

East London Railway Co.

An extraordinary meeting of the stock and debenture holders was held on February 17th, for the purpose of considering the terms offered by the Southern Railway for the acquisition of the company's system. Mr. Murray Griffiths, who presided, said that the only asset which they had in the line was the annual rent received from the Joint Committee. Those present had to bear in mind the fact that they were not selling property; they were asked to exchange their existing securities for securities in a much larger and more valuable company. The directors considered that they had secured the best possible terms. The resolution was carried after some discussion, and the terms of the Bill which the Southern Railway Co. intends to introduce into Parliament were approved on a show of hands.

Smithfield Markets Electric Supply Co., Ltd.

After paying debenture interest and other charges and transferring £4,500 to the depreciation fund and £2,500 to the debenture stock redemption fund, there is an available balance of £6,722. To this is added £2,101 brought in, making £8,823. The directors recommend a final dividend of 1s. per share (making 8 per cent. for the year); £2,000 is to be placed to reserve, and a balance of £2,023 carried forward.

Llanelly and District Electric Supply Co., Ltd.

The profit balance for the year 1924, including £1,071 brought forward, was £40,440. After the payment of debenture interest, &c., £4,500 to the tramway track renewals account, and £3,000 to reserve, it is proposed to pay a final dividend of 4 per cent. on the ordinary shares, making 7 per cent. for the year, and to carry forward a balance of £902. The company is acquiring the share capital of the Gorseinon Electric Light Co., Ltd., and is extending its transmission lines to Ammanford to supply an important colliery. The 7½ per cent. debenture stock has been redeemed and it is proposed to issue £200,000 of 5 per cent. debenture stock, and 50,000 6 per cent. preference shares. Meeting: March 3rd.

Constantinople Telephone Co.

A meeting has been called, for March 4th, of the holders of 6 per cent. obligation bonds and 5 per cent. certificates to consider a resolution to postpone the payment of the interest due on their holdings at January 1st, and to postpone payments due up to and including January 1st, 1927, until January 1st, 1928. The overdue coupons will bear interest at the rate of 6 per cent. It is also proposed to raise additional capital ranking before the obligation bonds and certificates.

Still Engine Co., Ltd.

Meetings of debenture- and shareholders were held on February 18th, by order of the Court, to consider a scheme of arrangement. The proposals were to reduce the capital to £94,227 10s., divided into 79,450 ordinary shares of £1 each, 220,550 ordinary shares of 1s. each, and 75,000 "A" shares of 1s. each; to convert the existing 79,450 unissued ordinary shares into 8 per cent. cumulative participating preference shares of £1 each; and, after the reduction, to increase the capital to £120,000 by the creation of 25,000 16 per cent. cumulative participating preference shares of £1 each, 388 further 8 per cent. cumulative participating preference shares of £1 each, and 7,690 further ordinary shares of 1s. each. A card vote was taken, but as the necessary three-fourths majority was not obtained the scheme was not carried.

Liverpool Overhead Railway Co.

Gross revenue receipts for 1924, £128,510; working expenses, including appropriation to reserves, £122,948; surplus on year's working, £5,562, plus £9,124 appropriated out of compensation received under 1921 Act, making £14,686. After deducting debenture stock interest £6,755, and adding £5,699 brought forward, 5 per cent. is to be paid on the preference shares and £5,689 carried forward. Passengers carried, 11,478,735, as against 11,865,752 in 1923.

German Companies.

The *Electricity Company* (late Schuckert), of Nuremberg, has reduced its capital to a Reich mark basis. The net profits of 37,000 marks for 1923-24 have been carried forward.

The *Continental Company for Electrical Undertakings*, of Nuremberg, which has transformed the paper mark capital to a Reich mark basis, reports that all its foreign properties have been lost through the war and the Treaty of Versailles.

The report of the *Siemens and Halske Company*, dealing with the year ended with September, 1924, states that the degree of activity was satisfactory, although the number of persons employed temporarily declined, and in some foreign

markets the business left something to be desired. After the deflation it became possible to simplify the administration, although not to the necessary extent. The sub-division of the Werner works, where there are over 20,000 employés, has now been carried out. The increased sale of automatic telephone installations has rendered possible the use of modern methods of manufacturing. The use of high-speed telegraph apparatus has been extended, as the Reich postal authorities have introduced the system in a special service for Press telegrams. In the further systematic development of the German long-distance cable network the company participated in a specially favoured measure; a good understanding was reached with regard to cable lengths of 720 miles, and it was possible to set in operation several long-distance lines abroad with complete success. On the other hand the department for railway safety appliances was still only slightly occupied, as the Reich railways were very reserved in the matter of large orders. The works in Vienna were satisfactorily employed, but the undertaking of Gebr. Siemens and Company, of Lichtenberg, suffered in consequence of the occupation of the Ruhr. In particular the results were unfavourably influenced through the closing of the Rhenish electrode factory, in which the Berlin firm is interested to the extent of 50 per cent. The staff and employés now number 103,000 persons.

The directors of the *Siemens-Schuckert Works Company*, reporting on the year ended September 30th, 1924, state that the home business revived in the spring and kept fairly steady after a short slackering. The trade with European countries had been rendered extremely difficult owing to the Customs barriers, and a change could only take place through favourable negotiation of treaties of commerce. In other foreign markets keen competition was manifested by all countries, including the United States; nevertheless, the extent of the foreign transactions was satisfactory. An exceptional activity was manifest in the preparation of schemes for the utilisation of water power and in "thermo-economy," which had already produced many orders and raised the hopes of still further contracts with a more favourable course of the money market. A revival in industry took place with the stabilisation of the currency. The winding engines for main shafts in mining work were more simple, and in the underground workings electricity was being increasingly substituted for compressed air, the Westphalian mining industry now associating itself with this movement. The water supply installation for the Rand mines in South Africa was brought into operation and proved satisfactory. In the case of the chemical industry the report mentions the placing in service of a power station for an aluminium works in South Germany. A number of home and foreign orders were received from the iron industry, large drives were also supplied for tube rolling mills, and a satisfactory increase occurred in orders for transporter installations at ironworks. In the case of shipbuilding the company had a satisfactory share of the orders, and good prospects existed for the employment of electrically-driven auxiliary machinery. Extensive orders were received for the electrical equipment of tramways and high-level and underground railways. In conclusion it is mentioned that the works built in Japan in conjunction with a Japanese company have been brought into operation.

French Companies. The report of the *Société des Forces Motrices de l'Ariege* for the last financial year shows a net profit of 627,060 fr., as compared with 530,238 fr. in the preceding year.

La Société Centrale pour l'Industrie Electrique, of Paris, reports a net profit of 3,807,130 fr. for the last financial year, as compared with 2,439,195 fr. in the preceding year.

Prospectuses.—Three issues guaranteed under the Trade Facilities Acts, 1921-1924, were advertised on Saturday last.

The North British Aluminium Co., Ltd., offered £2,500,000 4½ per cent. guaranteed debenture stock at £96 10s. per cent. This company was promoted last summer by the British Aluminium Co., Ltd., which holds the whole of the ordinary shares, for the purpose (*inter alia*) of constructing, equipping and operating aluminium works in Inverness-shire and of carrying out for the Lochaber Power Co. a sufficient portion of the hydraulic and hydro-electric works authorised by the Lochaber 1921 Act, to enable the Lochaber Power Co. to supply the necessary electrical power to operate the aluminium works.

The Stanton Ironworks Co., Ltd., offered an issue of £1,000,000—4½ per cent. guaranteed debenture stock and the Sudan Construction and Equipment Co., Ltd., £540,000—4½ per cent. guaranteed debenture stock, both at £96 10s. per cent.

Belgian Company.—The *Société des Tramways et Entreprises Electriques de la Banlieue de St. Petersbourg* was unable to present a balance sheet to the recent meeting of the shareholders in Brussels. Owing to the existing relations with Russia no definite news of the condition of its property has been received, although the directors reported that they had heard that the power station had been closed down and the boilers removed and sent to the Urals.

Scottish Power Co., Ltd.—The trading profits for 1924 of the undertakings with which this company is concerned amounted to £51,596. Of this amount the company receives £41,596 and after meeting expenses and adding the amount brought forward, there remains £40,964. A dividend at the rate of 8 per cent. is to be paid on the ordinary shares, £5,000 is transferred to reserve, and £2,504 carried forward.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Low Temperature Carbonisation.—150,000 ordinary shares of £1 each, fully paid, Nos. 355,946 to 505,945.

Yorkshire Electric Power.—13,000 ordinary shares of £1 each, fully paid, Nos. 1,090,001 to 1,103,000.

The undermentioned securities have been ordered to be officially quoted:—

Yorkshire Electric Power Co.—13,000 ordinary shares of £1 each, fully paid, Nos. 1,090,001 to 1,103,000.

Midland Counties Electric Supply Co., Ltd.—The report for the past year shows that the trading profits of undertakings owned and operated by the company amounted to £169,700. The contributions to reserves total £39,608, and the company receives £130,092. The balance, including £4,690 brought forward, is £128,107. After paying debenture interest, &c., and transferring £15,000 to general reserve, it is proposed to pay an ordinary dividend of 6 per cent. (as against 5½ per cent. in 1923), and to carry forward £4,457. Meeting: March 2nd.

Mansfield & District Tramways, Ltd.—The amount available from working during the year 1924, including £1,355 brought forward, is £17,985. Debenture and loan interest, &c., and interim dividends absorbed £13,189, and it is proposed to pay the remainder of the preference dividend, and a final dividend of 6 per cent. on the ordinary shares (making 9 per cent. for the year), leaving £1,374 to be carried forward.

Montreal Tramways Co.—At a meeting of the holders of 5 per cent. debenture stock, which is to be held in Montreal to-day (Friday), a proposal will be put forward for the exchange of all the outstanding 5 per cent. debenture stock for 30-year general and refunding mortgage sinking fund gold bonds at the rate of $101 worth of the latter for each $100 of the debentures.

Marconi Wireless Telegraph Co. of Canada.—The company is promoting a Bill in the Dominion Parliament empowering it to reduce the par value of its shares and increase the capital stock, and at the same time to change its title to "The Canadian Marconi Company."

Chelsea Electricity Supply Co., Ltd.—The directors have declared a final dividend at the rate of 15 per cent. on the ordinary shares, making 12 per cent. for the year as in 1923. £17,000 is allocated to depreciation, £15,000 to reserve, and £5,618 is carried forward.

Chas. Clifford & Son, Ltd.—Out of profits of £38,992 for 1924, it is proposed to pay a final dividend at the rate of 10 per cent., together with a bonus of 5 per cent., both free of tax, making 15 per cent. for the year.

Aberdeen Suburban Tramways Co.—The accounts for the half-year ended January 31st show a profit of £1,962. With the amount brought forward there is an available balance of £4,980.

Kensington and Knightsbridge Electric Lighting Co., Ltd.—Dividend of 10s. per share on the ordinary shares for the last half of 1924, making a total of 15 per cent. for the year, as against 14 per cent. for 1923.

Shawinigan Water & Power Co.—A dividend of $1¼ per share has been declared on the common shares for the quarter ending March 31st, as in 1923.

Mexico Tramways Co.—A half-year's interest is to be paid on the general consolidated first mortgage 50-year 5 per cent. gold bonds on and after March 2nd.

Bruce Peebles & Co., Ltd.—The dividend on the ordinary shares for 1924 is 10 per cent., plus a bonus of 5 per cent., as in 1923.

American Telephone & Telegraph Co.—A quarterly dividend of 2¼ per cent. is announced.

Mississippi River Power Co.—The preferred stock is to receive a dividend of $1¼ per share, payable April 1st.

Stocks and Shares.

MONDAY EVENING.

THE general condition of the Stock Exchange markets shows a good deal of quiet strength. Expectation fastens upon the idea that the Chancellor of the Exchequer will make a reduction of 6d. in the £ on the Income Tax, some people looking for a shilling in the £. There is plenty of money available for investment; new issues are taken up with avidity when they present solid attractions to the investor. Speculation is still quiet, although in certain directions the public are not averse from taking a hand in stocks and shares that offer a reasonable prospect of appreciation in price. The dividend announcements of the steam railway companies are not such as to encourage investment of money in Home Railway stocks. Prices of the tube companies have begun to recover from the unfavourable effect of the results disclosed by the reports issued ten days ago.

The market for electricity supply shares exhibits noticeable firmness. It is taken now for granted that both Bills, Nos. 1 and 2, having passed the second reading of the House of Commons, will go through Committee and the final stages without serious alteration or opposition. In consequence of this, and of the dividend results recently declared, prices are on the rise. County of London gained 2s. 6d. at 55s. 9d., the maintenance of the dividend being accompanied by allocations to reserve that drew quick appreciation from waiting buyers whose purchases had been restrained only by their wish to see the figures for 1924, before picking up the shares. Westminsters rose 12s. 6d., on the report. Charing Cross ordinary hardened to 47s., Kensingtons to 11¼, Londons to 36s., and South Londons to 2 9/16. Most of the companies have declared the same dividends as those of a year ago. The Kensington announcement is 1 per cent. up at 15 per cent., and the Charing Cross dividend, at the same rate, is slightly better than that of twelve months ago. Otherwise the list is almost unchanged and it is expected that the City of London will fall into line with the other companies in announcing an equal distribution, namely, 15 per cent., to that of last year. It is interesting to notice that this rate is being paid by the County, the Charing Cross, Kensington, Westminster and South London companies. The Clyde Valley, the Fife, and the Scottish Power dividends of 8 per cent. are all the same as those of the previous twelvemonth.

Speculation now concerns itself with the way in which reserves of the companies will be treated. When these come to be distributed amongst shareholders, the endeavour to fix a value upon the reserves of each individual undertaking may be a matter demanding a good deal of time and attention from the various authorities. Where reserves are invested out of the business, the matter will be plain enough sailing. In such cases as those, however, where the reserves are in a company's business, it remains to be seen on what ground the valuations will be made that shall determine the prices at which such reserves are to be treated. There may be surprises in store in this connection, but anticipation looks for these to be pleasurable; and buyers, as already noted, are taking all the shares which come to market.

Marconis are easier at 33/9 ex rights valued at 9d. per Marconi share. These rights are in respect of the new shares that will be offered, to holders of the ordinary and preference capital, in the proportion of one new ordinary share at 27s. 6d. for every six old shares held. It is assumed that, with this addition to the capital, the Marconi Company will be able to go ahead in more progressive fashion than has been possible for several years past. A contributory factor to the strength of the parent company's shares is the rise in Canadian Marconis, where the price rose rapidly from 4s. 6d. to 5s. 9d. Here, again, new capital has been provided for the Canadian Marconi Company that should be of substantial use in enabling it to pursue a vigorous programme of development. The Canadian Marconi company has ambitious schemes on hand; and, with broadcasting carried on to a much greater extent in Canada (as in the States) than it is in this country, there is wide scope for profitable expansion of the business. Radio Corporation Common have risen to 13¼. Jobbers in the market are rather amused at a New York demand that has arisen for the assets shares of the old American Marconi Company, American buyers being willing to pay a penny each for these gambling counters.

Metropolitan Railway Consolidated stock, moving upon its usual plane of aloofness from other railway stocks, is 30s. better at 92¼. The Underground £10 shares were offered at 2¼ before recovering to 2¾. East London is to be taken over, definitely by the Southern Railway. The valedictory meeting was a rather melancholy affair, but objections were courteously met and answered by the chairman, and the necessary resolutions duly carried.

London and Suburban preference fell back to 5s. 6d., the passing of the dividend bringing in stock from disappointed holders. Shares changed hands down to 4s. 6d. London United Tramways preference, the subject of a widely-circulated tip a few months back, have been sold as low as 4s. The British Electric Traction stocks retain their strength.

Globe Telegraph ordinary have risen to 18; the other members of this group hold the gains of last week. Tata Power "B" is better at 88, Great Northerns put on 12s. 6d., and Anglo-American preference 10s. Oriental Telephones advanced the fraction to 2⅛; Constantinople Telephones at 30s. are 5s. up.

Although iron and steel shares continue to show a languishing disposition, Babcocks mount superior to the dulness, and at 56s. 3d. display 1/16 gain. Callender's "B" preference have strengthened to 26s. 3d. Johnson & Phillips are a good market at 27s. 6d. buyers. Henley's preference, marked ex their 2s. 3d. dividend, have recovered the deduction. Their Liverpool friends are again buying Edisons, the price improving to 7s. Enfield ordinary keep hard at 53s. 9d., and Telegraph Constructions rose another 5s. to 27½.

Victoria Falls ordinary at 44s. 6d. and the preference at 31s. 3d. are unaffected by the dulness that has crept over South African mining shares as a result of the appreciation in sterling compared with the dollar. The rubber share list derived a little encouragement from a substantial decrease in this week's stocks of raw rubber on hand. Several important industrial companies are raising new capital, at moderate rates of interest, under the powers given by the Trade Facilities Act.

Share List of Electrical Companies.

	Nom. £	Dividend. 1922.	Dividend. 1923.	Price Feb. 23. 1924.	Rise or fall.	Yield. p.c.
Home Electricity Companies.						
Bournemouth and Poole ...	1	10	13	2⅛	—	4 13 0
Brompton Ordinary	1	12	10	1⅝	—	*5 6 8
Charing Cross Ordinary	1	14	14½	47/-	+9d.	6 7 7
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	10	12	27/6	—	6 8 0
City of London	1	15	15	49/6	—	6 1 0
do. do. 6% Pref. ...	1	6	6	23/6	—	5 2 2
Clyde Valley	1	8	8	28/-	—	5 14 4
County of London	1	10	15	55/9	+2/6	5 7 6
do. do. 6% Pref. ...	1	6	6	23/6	—	5 2 2
Edmundson's Ordinary	1	7	7	21/-	—	6 13 4
do. 7% Pref.	1	6	6	22/6	—	6 4 5
Elec. Supply Corporation ...	1	8	10	27/-	—	7 8 2
Kensington Ordinary	5	12	14	11½	+ ½	6 10 5
Lancs. Light and Power ...	1	Nil	7½	27/-	—	5 11 1
London Electric	1	10	10	36/-	+1/-	5 11 8
do. do. 6% Pref. ...	5	6	6	5½	—	5 9 1
Metropolitan	1	8½	10	1¾	—	5 6 8
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5	5½	24/3	—	4 10 7
Newcastle-on-Tyne Ordinary ...	1	2½	6	20/9	—1/9	5 15 8
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	9½	—	6 4
North Met. Elec. 6% Pref. ...	1	6	6	1¼	—	5 6 8
St. James' and Pall Mall ...	5	14½	17½	13½	—	6 12 3
South London	1	11	15	2⅞	+ ⅛	5 17 0
South Metropolitan Pref. ...		7	7	1½	—	5 12 0
Urban Ordinary	1	—	4	12/9	—	4 5 4
do. 6% Pref. ...	1	5	6	19/6	—	6 3 1
Westminster Ordinary	5	12	15	11½	+ ⅛	6 7 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/-xd	—	5 10 4
Home Rails.						
Central London Ord. Assented	Stock	4	4	73xd	+ ½	5 11 1
Metropolitan	,,	3½	4	63½	+1½	6 1 3
do. District	,,		3½	52½	—	6 13 4
Underground Electric Ordinary	10	Nil	Nil	2⅝	+ ⅛	Nil
do. do. "A" ...	1	Nil	Nil	8/6	—	Nil
do. do. Income	Bonds		6	103	—	*5 17 10
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	104½	+ ½	5 14 10
do. Def.	,,	1½	1½	28⅜	—	6 6 4
Automatic Telephone	1	Nil	3	1⅜	—	1 17 0
Chili Telephone	5	6	6	5½	—	*5 4 4
Cuba Sub. Ord.	10	7	7	7½	—	9 13 3
Eastern Extension	10	10	10	17½	—	*5 12 8
Eastern Tel. Ord.	Stock	10	10	175½	—	*5 14 0
Globe Tel. and T. Ord.	10	10	10	18	+ ½	*5 11 1
do. do. Pref.	10	6	6	11½	—	5 7 10
Great Northern Tel.	10	24	23	31½	+ ⅜	7 1 6
Indo-European	25	7	7	32½	—	*5 6 1
Marconi	1	15	10	1½xr	—	5 18 6
Marconi Marine	1	10	10	1⅛	—	8 17 10
Oriental Telephone Ord. ...	1	12	12	2⅛	+ ⅛	*5 13 0
United R. Plate Tel.	5	8	8	6⅞	+ ⅛	*5 18 6
Western Telegraph		10	10	17½	—	*5 16 0
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref. ...	5	12½	5½	3¾	—	8 9 2
do. do. 2nd Pref. ...	5	5½	6	3⅛	—⅛	9 16 0
do. do. 5% Deb. ...	Stock	5	5	76½	—	6 10 9
British Electric Traction Ord. ...	,,	5	6	101½	—	5 18 3
do. do. 6% Pref. ...	,,	6	6	106½	—	5 12 9
Brazil Traction	100	4	4	57	—	7 0 4
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	92½	+1	5 8 1
do. do. Preferred	,,	5	90/-	92½	+1	*5 8 8
do. do. Deferred	,,	8	129/5	113½	—	*5 14 8
do. do. Deb.	,,	4½	4½	81½	—	5 4 4
Lond. & Sub. Trac. 5% Pref. ...	1	5	2½	5/6	—6d.	Nil
London United Tram. Deb. ...	Stock	4	4	51½	—	7 15 4
Mexico Trams, 5% Bonds ...	—	Nil	5	72	—	6 19 0
Mexican Light Common ...	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	60½	—	Nil
do. 1st Bonds ...	—	5	5	67	—	7 9 3
Yorkshire (West Riding) ...	1	—	5	1⅛	—	4 14 8
Manufacturing Companies.						
Babcock & Wilcox	1	20	12	56/3	+1/6	*4 5 3
British Aluminium Ord.	1	5	5	82/-	—	3 2 4
British Elec. Transformer Pref.	1	Nil	Nil	17/6	—	... ...
British Insulated Ord.	1	15	15	3	—	5 0 0
Brush Ord.	1	10	10	24/6	—	8 3 4
Callenders	1	15	15	8⅛	—	4 17 10
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	5	Nil	¼	—	... ...
Edison-Swan	4/-	7½	10	7/-	+6d.	5 14 3
do. 5% Deb.	Stock	5	5	81½	—	6 0 3
Electric Construction	1	10	10	32/6	—	6 3 1
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	8	5	20/3	—	4 18 9
do. do. Pref.	1	6	6	21/6	—	5 11 7
Gen. Elec. Pref.	1	6½	6½	23/3	—	5 11 10
do. Ord.	1	5	5	22/3	—	4 10 0
Henley	1	15	15	3	—	5 0 0
do. 4½% Pref.	5	4½	4½	4½xd	+1/9	5 6 0
India-Rubber	1	10	5	17/6	—	*5 14 3
Johnson & Phillips	1	5	5	1⅜	+⅛	3 12 3
Met-Vickers, Ord.	1	12½	8	1½	—	6 8 0
do. Pref....	2	8	8	2½	—	6 8 0
Siemens Ord.	1	5	—	1⅞	—	4 4 0
Telegraph Construction	13	20	20	27½	+ ½	*4 7 0

*Dividends paid free of Income Tax.

The World's Largest Engineering Project.—III.

The Undertaking of the Southern California Edison Co.

By T. B. ROSS.

(*Concluded from page* 300.)

Camp Life in the Mountains.—(*Continued*).

I had rather an amusing, though at the time somewhat unpleasant, experience one day in camp. For a while I was engaged on some special statistical work which necessitated my working alone during the night hours in order to have access to certain figures not available during the usual day-working hours. Coming off duty at 1 a.m. I used to turn in and sleep until about 9 a.m., when the rest of those in my bungalow would be away on their different duties. Periodically, the company fumigates all living quarters, as wooden-built quarters are liable to become disagreeable otherwise. It so happened that one of the mornings whilst I was asleep in my cabin, orders had been given to fumigate. All windows, doors, and air spaces being closed, the man in charge started operations. Placing a tin containing four thick sulphur candles in each cabin, he arrived at my cabin last of all. Presumably by this time the man was half blinded by the fumes he had already started, as although he came within a few inches of my bed he did not see me, and therefore placed another tin on the small stove between the two beds. Having done this, he closed the cabin door and afterwards the main door of the bungalow, proceeding to another part of the camp on other duty. I have no idea how long those candles were burning, but by the time I awoke the room was full of sulphur fumes, and I was having a hard struggle to breathe. It called for quick action, so, seizing a pair of slippers in my hand, I, as the Yankees say, "soon started to beat it." Fortunately, he had not locked the doors, and in double-quick time I was outside that bungalow breathing in all the fresh air I could, and apparently looking like a human fly in its last kick for life. To crown all, it was at the very moment when many of the men's wives were wending their way past our bungalow *en route* to the company stores to do their morning's shopping. One can imagine the shock they must have received to see "English" clad only in his silk pyjamas and a pair of pumps carrying out "physical jerks and breathing exercises" at such an hour. However, my pal the doctor fixed me up later with a temporary kit, which I had to wear until 4.30 that afternoon, when it was again possible for me to enter the bungalow. I tasted sulphur with all food for the next three days. But the escapade had some good effect. By evening I was probably one of the best-known "foreigners" in Big Creek, and my English sleeping attire was the talk of all the ladies in camp.

There were many other amusing happenings to myself and others in the camp during my stay, but space will not permit of my recounting them here.

The employment question in the camps is one of the biggest problems the company has to contend with. I was told by one of the responsible officials of the Employment Department that the total of men handled was approximately seven men for every job in camp.

To remove as far as possible the feeling of isolation and monotony, kinema entertainments, boxing contests, and concerts, lectures, &c., are organised by the company each month. Men, women, and children attend most of these, and their favourites in the "ring" receive every encouragement to "knock-out" the opponents, particularly if such happen to be visitors from other camps. The company has a very rigid law regarding quarrels amongst its employés in the mountains, and any men coming to blows find themselves ordered "down the hill" on the next day's train; in other words, immediately discharged. It is the only way to keep peace in camp. For those who want a "scrap," the monthly boxing contests are available, which, needless to say, are fully made use of. Judging from the few events I saw, it was not boxing as we know it in England, but plain, undisguised slaughter. Only three rounds, each of two minutes' duration, are allowed for each bout, but these generally prove more than sufficient to obtain a verdict as, owing to the rarefied air at such high altitudes, even the fittest men become exhausted towards the end. Often a "knock-out" is obtained in the first or second round. It was a somewhat displeasing feature to see the keenness displayed by the womenfolk and children on such occasions.

There is little to be had in the way of outdoor sports in the camps, excepting "hiking" (walking) and a tennis court, the latter only being made use of by a few of the permanent officials and Britishers. Ski-ing and tobogganing are enjoyed by a few enthusiasts during the snow period, but, generally speaking, the average camper's idea of amusement is to be found around the card-tables or in a game of "pool" (American billiards) in the "pool halls."

The company has organised social clubs throughout its territory, which apparently are a great success in Los Angeles and other centres where the permanent staffs are to be found. The branch up at Big Creek is known as "The Mile High Club," of which most of the permanent officials are members.

The Company's Service.

Specially low rates are given to large industrial users and others, and it is claimed by the company that its rates are the lowest of any electric supply corporation or municipality in the whole of the United States. Until 1917, the company supplied the City of Los Angeles direct with electricity, but in that year the L.A. Bureau of Power and Light took over the Edison Company's City distributing system, for which it paid the company $11,000,000. The rate charged by the L.A. Bureau of P. & L. is 5.6 cents per kilowatt-hour. In the contract between the City and the company, the latter has to supply the City Bureau with all electricity required over and above the City's own output from its municipal plants on the L.A. Aqueduct. The rates chargeable by the company vary according to the amount used, and for November, 1923, the rate was .7726 cent per kilowatt-hour. The average rate for the year 1923 was .8759 cent per kilowatt-hour, but this figure did not cover the new reduction made by the Railroad Commission of 7½ per cent. to apply to future supplies.

The following comparative costs of electric service should prove of interest to electric supply engineers at home; they are official and compiled by the U.S. Bureau of Census, Central Stations. The figures denote gross revenue from sales of electricity per kilowatt-hour in the various States named:—

	Cents.		Cents.
Maine	2.38	Illinois	4.03
Massachusetts ...	3.98	Iowa	7.36
Connecticut ...	4.07	Louisiana	4.23
New York	2.52	Texas	4.57
New Jersey	4.73	Colorado	3.04
Virginia	2.48	Michigan	2.72
Ohio	2.68	California	2.34

In comparison with the above rates, the gross revenue per kilowatt-hour received by the Southern California Edison Company works out at 1.75 cents over its territory of 55,000 square miles. Another interesting and favourable comparison for commercial plants over municipal plants is that obtaining in the United States,

The average of all the *commercially* operated plants combined is given as 1.97 cents, as against 3.91 cents per kilowatt-hour for the average of all *municipally* owned plants. The reason given by the Edison Company for its low rates is that it has a connected load of over 800,000 h.p. of so diversified a nature that the peak load does not exceed 375,000 h.p., thus maintaining a high load factor.

General Remarks.

Practically all employés holding, or likely to hold, any responsible position with the Edison Co. are "bonded" for some thousands of dollars each with one of the largest fidelity insurance companies in New York. Newcomers have to fill in lengthy application forms and answer many and varied questions of both a personal and an impersonal nature. The history of applicants is asked for covering a period of ten years, and five or six references have also to be given, preferably from United States citizens. Some of the information desired seemed to me somewhat superfluous, and from an Englishman's point of view rather silly. Fancy asking a man to say whether or no he had ever gambled! I replied "Certainly," and apparently the answer did not prevent the insurance company accepting me for the company. But the Americans to-day are "set" on bonding all their officials, so one might as well agree to their requirements if desirous of peacefully working with them. They appear to place much confidence in Britishers and Canadians, as proof of which many of the best positions are held by our people.

Whilst dealing with this subject, perhaps a few fair criticisms of Americans as they appear to an Englishman who lived and worked amongst them may not be amiss. I was from the outset greatly impressed by the energy and vim with which they tackle their big problems and propositions. As a nation, they think and see life with the "big vision" so far as their own country is concerned. The ordinary untravelled citizen, however, has little idea of or interest in the rest of the world, and is inclined to be insular and prejudiced in his attitude towards all foreigners, particularly the English. The educated and travelled American is generally a most entertaining and delightful fellow, possessing all the attributes of a gentleman in the true sense of the word. The rough element so predominating in the country can indeed be very rough, but one has to remember that America is still passing through its nursery days, and has much to learn before it can be expected to equal the more cultured peoples of Europe and other parts of the world. To-day, as a nation, they are stricken with the "dollar fever," which attacks both old and young alike—money talks in America with a deafening voice. But with their great wealth they are generous in many directions. The facilities for education to all classes are remarkable. Children, men and women of a studious nature, have opportunities for learning not obtainable in any other country and at charges so low that even the poorest can enjoy such privileges. During the long "vacations" the big companies and organisations throughout the country assist college and other students by offering positions in which the wages paid are sufficient to allow of their saving enough to pay for the following term's fees and expenses.

The reference libraries in the big cities contain the very latest books on science and other educational subjects from all the principal American and foreign publishing houses, and are so well arranged and staffed that one can pick up the books sought without any undue delays.

There is practically no sentiment in business in the States, and any man who is not equal to his job is "fired" at very short notice. This rule, however, has a reactionary effect. A good workman will demand his time-sheet to be made up at often only a day's notice should he have been offered or have heard of a better job with some other company, and as good workers are in the minority in America, particularly on construction jobs in isolated districts, delays and expense occur whilst filling up the vacancies. I was told that for every man sent up to the camps who did not remain on his job over three months, the company lost about $60, this figure covering the cost of transportation, organisation, &c., per man.

All employés of the company, even the girl stenographers, elevator operators, &c., in the Los Angeles offices, have to pass a strict medical examination before joining the company, and for those going up to the camps the examination is particularly thorough. Blood-pressure, heart, lungs, eyesight, and many other tests have to be passed, and all applicants have to "strip." As a result of these wise precautions, there is practically a complete absence of sickness and disease, and the main cases requiring medical attention are from accidents in the field or from the occasional mishaps which occur in the drilling and blasting of tunnels. At times men are, unfortunately, killed at their work, but thanks to the Employés' Insurance Fund, organised and supported jointly by the company and its employés, relatives or dependents are immediately taken care of and receive about $2,000 from the fund in such cases of accidental death.

The camp hospital at Big Creek has accommodation for about 20 or more sick cases, and is fitted up with the most up-to-date medical appliances, as well as an operating theatre. The surgeon, a Scotch-Canadian, and his staff of male nurses, work solely for the company, and recently a company dentist has been appointed for Big Creek Camp. Other hospitals, of smaller capacity, are to be found in the outlying camps where found necessary.

The "Edison spirit" so much cultivated by the company and its officials is to be found in all sections of the undertaking, and it has done much to foster the keen enthusiasm of not only all employés, but also the present and prospective users of the company's product throughout Southern California. The Edison stock is highly thought of by the investing public of California, particularly round Los Angeles, and there is always a ready market for Edison securities. The stockholders embrace all classes, from newsboys to bank presidents, and consequently have no lack of "boosters" amongst new arrivals to the southern part of the State. Such enthusiasm is typically American, and is probably one of the principal causes for the great progress and success of the Southern California Edison and other big undertakings of America. A little of the same keen spirit amongst our own people at home would, no doubt, be of invaluable help in tackling some of our own industrial problems of to-day.

Trade unionism in Southern California is conspicuous by its absence, and practically all work is carried out on the "open shop" principle, which is claimed by the Los Angeles Chamber of Commerce and other big influential organisations as one of the secrets of the country's present growth and prosperity.

Conclusion.

In concluding this last article I feel that I ought to record my appreciation of the kindness extended to me by many of the Americans and other nationals I met in camp, including the resident engineer and the department chief under whom I worked. I found at first that a certain amount of reserve or misunderstanding existed between the average American and Englishman, but this generally proved to be superficial, and once they got to know one another a mutually good and friendly feeling matured. We Britishers can learn much from Americans; and *vice versa*, they have much to gain by studying British ways and customs. The narrow, insular feeling observable amongst certain sections of the people in both countries should in time, it is hoped, disappear, particularly as transportation across the Atlantic improves and becomes cheaper.

As one who has lived for some years in British Columbia and Western Canada, I feel confident that if Canadian and British capitalists were to expend the money necessary to develop the hydro-electric possibilities of the Cascade and Rocky Mountains in B.C., that pro-

vince would become as prosperous and thickly populated in time as California is to-day. It is often stated by big men of Canada and America that the Pacific coast of North America will some day be the centre of the world's markets. This may be rather a big claim, but there is not the slightest doubt that the future of the Pacific coast is enormous, and I venture to say that in Canada, particularly Western Canada, Great Britain has a market of such potential value to her that constant and thorough working co-operation of British manufacturers and their trade organisations to capture that market would, in time, open up new channels for exports, and more than warrant the initial outlay necessary to establish British goods in front of all other competitors. The natural resources and mineral wealth of British Columbia alone are almost beyond computation, and it is only a question of time to see the province developed beyond the belief of most people of this generation.

What California is doing to-day, British Columbia will surpass in the future, and the next decade or two will decide whether she is to develop through the financial backing and help of her Mother Country, Great Britain, or by the eager and willing assistance of her "neighbours across the line." To which should she have to look?"

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

The "Mic-Met" Crystal Detector.

To those interested in comparing different crystals the British-made "Mic-Met" rectifier sent us by Messrs. C. & J. Arrigoni & Co., Ltd., should be very useful. As will be seen from fig. 1, it is glass contained and one of its chief merits is that it can be handled without the components coming apart so that the device collapses. The large knob revolves and alters the point of contact relative to the contactor (cat's whisker) in the projector screw; by revolving the medium knob

Fig. 1.—The "Mic-Met" Crystal Detector.

the contactor is moved radially across the face of the crystal and so changes the point of contact between the crystal and whisker; and by revolving the small knob in either direction the whisker is made to move towards or away from the crystal without rotation. The applied mechanism being micrometrical in principle excellent adjustment is obtainable, and to remove the crystal, if necessary, the large knob is unscrewed from the flange and then from the spring cup crystal container, another crystal being then easily substituted. In addition, the cat's whisker screw mechanism is removable as a whole and the whisker itself also, these operations being carried out without requiring the other parts of the rectifier to be dismantled.

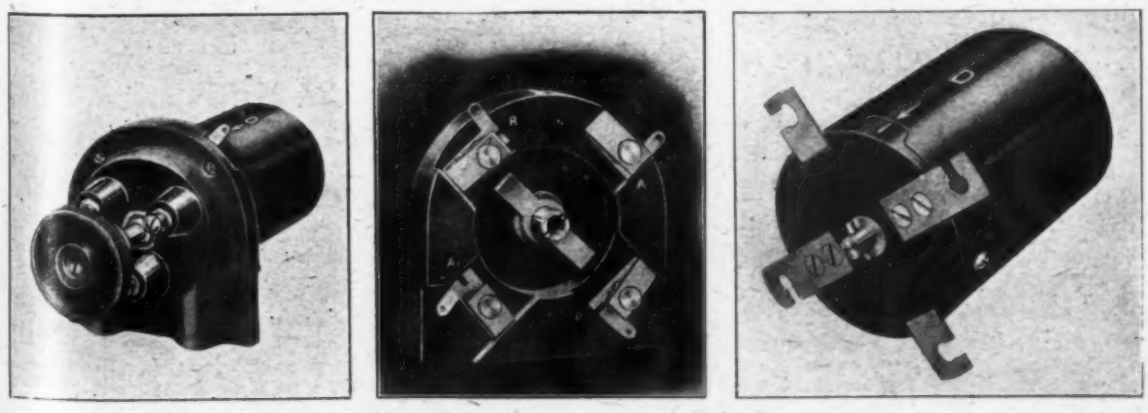
Sterling Anode Reaction and Tuning Unit.

Users of Sterling radio valve sets appreciate the easy way reaction is applied by means of the anode reaction and tuning unit, which normally provides an anode coil with its appropriate reaction coil, it being possible to couple the latter to the anode coil in a very effective manner. The unit is clipped into a special adaptor permanently fixed to the panel and provided with four connection tags; fixing the unit into position can be accomplished in a few seconds. The advantages of this system are obvious—no bulky coils are needed, there is never any doubt as to which reaction coil should be used, and the whole of the anode-reaction circuit is behind the panel. Eight units are available, covering between them a range of from 40 to 5,000 metres when used in the anode circuit, and tuned by a 0.00025 mfd. Sterling square-law condenser. Alternatively, the units can be very effectively used in the aerial circuit, when reaction is applied to the aerial; as an example, with a 0.0005 mfd. square-law condenser in series, the "D" unit covers an approximate range of from 275 to 485 metres, but by means of simple switching this range can be extended to from 275 to 925 metres. The complete series (with switching) covers a range of from 275 to 7,600 metres. Fig. 2 shows the complete unit with adaptor; fig. 3 illustrates the adaptor, for panel mounting, as will be seen from fig. 4 the unit is provided with four substantial connection lugs, which engage in spring clips on the adaptor, and the coils are effectively protected by a case of insulating material.

The Toplis Telephone Receiver.

The Toplis receiver has been designed with the object of imparting to the diaphragm a vibration resembling, as nearly as possible, that of a stringed musical instrument. The Bell receiver does not do this, in view of the fact that the diaphragm is under the influence of the magnetic system on *one side* only, the result being that the diaphragm vibrates between positions in the normal and convex. In the Toplis pattern, the diaphragm vibrates between the convex and the concave.

Fig. 5 shows a cross section of a telephone receiver of the "Watch" pattern designed on these lines; the essential features are two pairs of permanent magnets, with their associated electromagnets arranged as shown, together with the diaphragm. The latter may be fitted between the pole pieces, as shown in fig. 6, or clamped immediately below the earpiece in the usual manner. If the latter arrangement be adopted, the diaphragm A, fig. 5, is rigidly connected by means of a light non-magnetic rod to a soft-iron strip B mounted between the pole pieces; this arrangement is shown in fig. 5. The strip need be of no greater width than the pole pieces themselves, and it may be clamped at either end, as shown, or allowed to "float" between the poles. Further, it may be clamped and subjected to longitudinal tension from either



Figs. 2 to 4.—Sterling Anode Reaction and Tuning Unit.

end. With this arrangement, a diaphragm of non-resonant material may be employed.

The polarity of the permanent magnets is such that on each side of the diaphragm, or strip, like is presented to like; this is shown clearly in fig. 6. It will be seen that the soft iron placed between the poles of like polarity assume an unlike polarity, which is indicated by the dotted letters. The direction of the permanent magnet field will be as indicated by the dotted lines. Further, in view of the fact that the soft iron is inductively polarised, there will be no tendency towards depolarisation.

The electromagnets (which may be coupled together either in series or parallel) are wound in such a manner that with a current flowing in a given direction, permanent magnetic fields on one side of the diaphragm are assisted, while, at the same time, they are opposed on the other. Referring to fig. 6, it will be seen that, with the polarity as shown, the diaphragm would be drawn up, whereas with a reversal of current it would be drawn down.

In applying this design to "loud-speaker" construction, it has been found that there is no necessity to damp the diaphragm, also the horn may be dispensed with, as an aid to the improvement of tone. In an experimenttal model which has been made it was very difficult, when standing some distance from the instrument, to detect any difference in tone or volume when the horn was removed.

In the model shown in fig. 7, a standard 3-in. flat surface Stalloy diaphragm is employed, and the tone is quite equal to standard "speakers" of the horn type. No damping is provided, the diaphragm being clamped between two halves of the container case. The knobs shown at each end provide adjustment for the magnet system.

It is known that the double movement of the diaphragm has been obtained by earlier investigators, including Nathaniel Baldwin, of U.S.A., Domenico Marzi, in Rome, and others. In every instance, however, the inventor has introduced mechanism operating on the diaphragm in an indirect manner, whereas the present instrument, it is believed, is the first wherein the double movement is imparted to the diaphragm direct, without the aid of any intermediate devices.

Mr. Leslie G. Toplis informs us that his patent has been accepted by the British Patent Office, and that protection has been applied for in foreign countries.

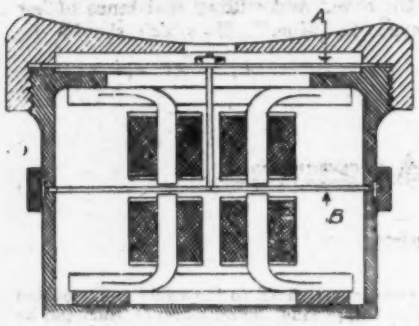


Fig. 5.—Toplis Telephone Receiver.

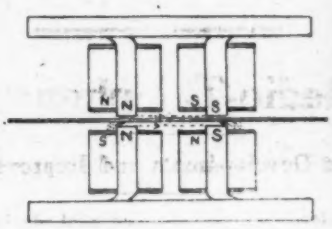


Fig. 6.—Position of Diaphragm.

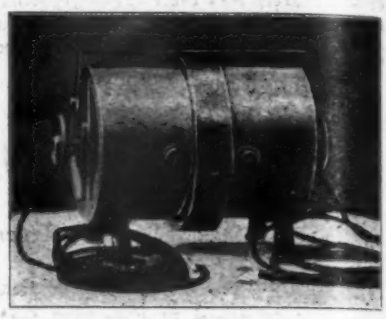


Fig. 7.—Toplis Loud Speaker.

Electricity in Mines.

By Major E. IVOR DAVID, M.I.E.E.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

THE mining industry is at the moment very much before the public as a wasteful and unscientific example of private enterprise, so that an account of some efforts to achieve efficiency, and a few results of tests made with this end in view, may possibly prove that the industry generally is not as black as it is painted.

Part 1 deals with power production at mines, explaining briefly the essential differences between a colliery and normal power plant. The first high-pressure high-temperature station of moderate size in this country, and possibly in the world, to operate continuously was installed in connection with a group of collieries.

TABLE I.—COKE-OVEN GAS UTILISATION FROM 150 OVENS.
All values are expressed as percentages of the cost per unit in the coal-fired station.

	Old gas engines.	New gas engines.	Gas-fired boilers.	Coal-fired boilers.
Wages	16.25	12.95	8.78	8.78
Fuel	41.8	34.4	41.3	46.18
Stores and other charges	23.0	21.8	10.1	10.1
Repairs and renewals not included in stores ...	15.1	7.8	3.74	3.74
Capital charges	21.8	31.2	31.2	31.2
Expressed as percentage of coal-fired station ...	117.95	108.15	95.12	100.0
Station thermodynamic efficiency, per cent. ...	19.05	24.0	19.35	16.35

A colliery power station should be capable of dealing with all classes of fuel which from time to time are not marketable, mostly of the lower grades. The utilisation of coke-oven gas is a difficult problem. Gas engines have higher thermodynamic efficiency, against which higher maintenance cost, poor flexibility and reliability have to be weighed. Compared with modern high-efficiency turbine plant, the margin of thermodynamic efficiency in their favour is small, and in most cases it is a better commercial proposition to burn the gas under boilers.

Table I compares the cost per electrical unit for the two methods of utilisation. The gas engines are of the 1,600-kW low-speed, 4-cylinder type, and the steam plant is a 350-lb./sq. in., 700 deg. F. installation, the gas being used to supplement coal firing in 35,000-lb. boilers. The test efficiency when coal fired was 87 per cent. and the daily efficiency from 80 to 82 per cent., so that an efficiency of 85 per cent. for gas firing is reasonable.

The gas-engine figures are based on an output of 16 million units per annum. The new gas engines are fitted with waste-heat recuperator boilers. The gas- and coal-fired steam stations are based on an output of 150 million units per annum. The disposal of coke breeze and coke ashes has also to be provided for. A system of blanketing with medium volatile coal has proved a satisfactory method of burning them. Low-grade fuels should be washed if the ash content exceeds 10 per cent., but a minimum of from 5 to 6 per cent. ash is quite low enough.

The high capital cost of extra-high-pressure and extra-high-temperature steam, combined with the attendant fuel-saving devices, such as evaporators, feed-water heaters fed with bled steam, air-heaters, &c., hardly seems justified with cheap fuel delivered directly to the boilers free of railway charges, but in some collieries where all fuel raised has a fairly high value high capital expenditure may be justified.

Boiler efficiencies of from 70 to 75 per cent. can be maintained with fuel of high calorific value, even in small colliery plant, but require constant high-class technical supervision, which can better be concentrated in large central stations. Where fuels are available which cannot be burned on ordinary stokers, pulverising is a feasible proposition.

Water for both boiler feed and condensing purposes is one of the great difficulties at most collieries, and at high-pressure stations evaporators are a necessity. Compound-filled switchgear seems to meet most requirements. Power factor correction has become a pressing need, and the best results have been obtained from synchronous motors driving the larger units.

Part 2 of the paper deals with modern methods of driving the four main power-consuming units at mines, with particular reference to the utilisation of synchronous motors, and compares a.c. and Ward-Leonard control of winders. The units consumed per ton of coal raised for a modern colliery raising 2,000 tons of coal per day from a depth of 600-700 yards and using compressed air for cutting, conveying, in-bye haulage, and pumps are given in Table II.

TABLE II.

	Units per ton.
Winder	4
Fan	3
Compressed air	20
General pit use	1½
Pumping	3½
Total	32

These figures apply specifically to South Wales conditions with highly-developed compressed-air utilisation, and very different figures will be obtained in other districts.

The multi-stage turbine pump is particularly suitable for use in mines. Up to 150 h.p., squirrel-cage motors are quite satisfactory, particularly those with Boucherot rotor windings which may be switched directly on to the line. Auto-transformers for starting are unsatisfactory, and slip-ring motors are preferable above 150 h.p. High power factor and efficiency are obtainable with 4- or 2-pole machines of all

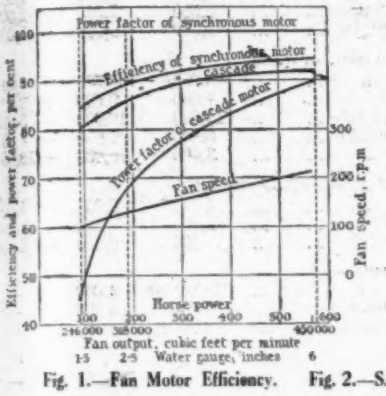


Fig. 1.—Fan Motor Efficiency.

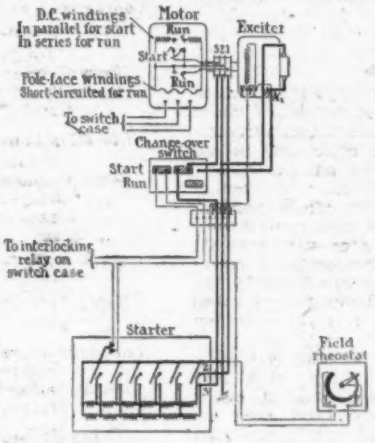


Fig. 2.—S.G.E. Salient-pole Synchronous Motor Connections.

sizes, and only in exceptional circumstances need synchronous-type induction motors be considered for pump drives.

Ventilating fans provide an almost uniform load and are particularly suited for power factor correction. The starting torque required is moderate, but, as it is usual to start fans under load in this country, the synchronising torque required is high. Salient-pole motors cannot give the required torque, and cylindrical-type rotors are used. Experiments have been carried out in the United States with salient-pole machines using a friction clutch drive and also reducing the starting effort by closing the fan discharge. The requirements gradually increase in both volume and pressure as roads lengthen and workings extend, but variable-speed motors hardly justified their extra cost and lower efficiency, particularly on low loads. Recently the author introduced the jockey-pulley drive with modern improvements, and this has proved a most efficient method of speed reduction. To change the fan speed, all that is necessary is to change the motor pulley. A comparison of the efficiencies of a cascade motor and of a synchronous motor is given in fig. 1.

In addition to the very much higher efficiency at all loads—an important factor in a machine which runs for 8,760 hours per annum—power factor correction can be obtained up to 0.80 leading at full load, and to a still greater extent at lower loads. Further, the initial cost of the variable-speed motor and starting gear is 10-15 per cent. higher than that of the synchronous motor. Reduction of ventilation during week-ends or stop days is a questionable economy. Mining engineers usually prefer to maintain full volume of air to clean out the workings and dilute gas. Where reduced speed and water gauge are clearly required at week-ends or stop days, two-speed cascade motors of either the ordinary or synchronous type are giving satisfactory results.

Starting a 450-kVA synchronous induction-type fan motor on light load (about 90 kW), excited to a power factor of about 0.5 leading, improved the power factor of a colliery system from 0.7 to 0.87 or 0.9, and the voltage at the busbars increased from 3,050 to 3,150 volts, with both a.c. winders off.

The Lenix belt drive has some peculiar properties. There is no measurable slip; in fact, the speed ratio appears to be proportional to the diameters of the pulleys, plus the belt thickness, *i.e.*, the diameters to the neutral axis of the belt. It is very difficult to give accurate figures for the efficiency, but the belt drive appears to be equal, if not superior, to a high-class helical gear reduction.

Another interesting type of synchronous motor for fan drives has a salient-pole rotor with extended pole-tips having a single-phase winding in semi-enclosed slots. The pole windings are split in halves for starting, and are connected as a second phase, a metallic resistance being in series with these two windings. The motor starts and has a torque characteristic similar to that of an ordinary slip-ring machine. The pole-face winding is short-circuited when up to speed and forms an amortisseur. The salient-pole winding is excited in the usual way. Fig. 2 shows the connections. The advantages of this machine over an induction-type synchronous motor are higher efficiency and normal voltage excitation.

The high-speed vertical two-stage compressor favoured in this country for electric drive was until 1918 thought to be unsuited for direct coupling to salient-pole synchronous motors, and the wound type of rotor with its higher starting torque was considered necessary. Owing to unsatisfactory experiences with this type, the author carried out a series of starting experiments, but meanwhile a salient-pole synchronous motor had been installed in a Lancashire colliery to drive a Belliss vertical compressor; it was soon found that the clutch was unnecessary, and two salient-pole motors of 1,125 h.p. at 214 r.p.m. were installed to drive vertical two-stage compressors having an output of 6,500 cu. ft. per min.

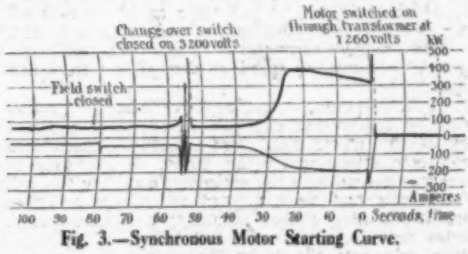


Fig. 3.—Synchronous Motor Starting Curve.

compressed to 75 lb./sq. in. Starting curves of one of these are given in fig. 3. Slightly more than full-load current is taken at the start and when changing over from tap to full voltage; this is momentary and is carried by the system with a hardly appreciable voltage drop. Owing to the large air gap, it was possible to dispense with the bearing between the compressor flywheel and the rotor, thus reducing the length of the set by 4 ft. compared with a synchronous induction motor of similar horse-power. The efficiency of these motors at full load and unity power factor is 95.7 per cent., a remarkable figure for motors of this size and speed. The corresponding figure for a synchronous induction motor is 93.2 per cent.

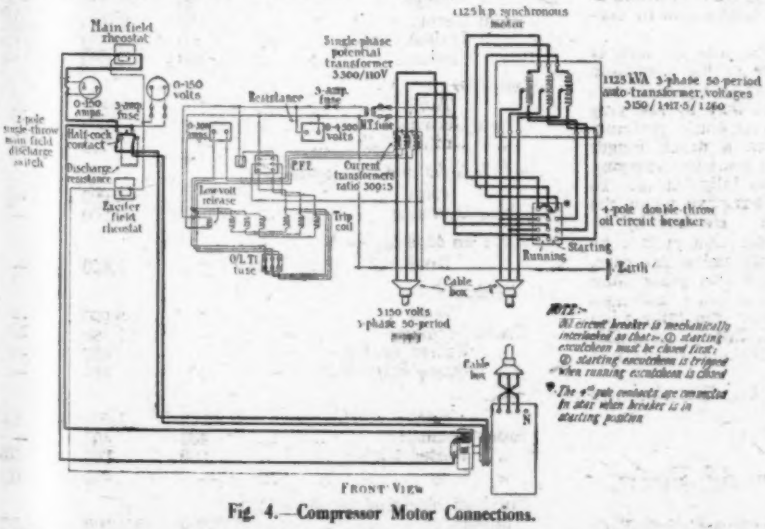


Fig. 4.—Compressor Motor Connections.

A comparison between the efficiencies of this type of equipment and a large steam-turbine compressor is of interest. The losses in transmission for compressed air and electrical power for distances up to five miles are nearly equal. Ignoring these losses, the comparison can be carried back to the power station. To supply 1,110 h.p. (830 kW), assuming an alternator efficiency of 95 per cent., requires 872 kW at the turbine coupling. The direct-coupled turbo-compressor has the same steam consumption, and for 1,038 h.p. (775 kW) takes 11.2 per cent. less steam than the electrically-driven unit. The latter has one compensating advantage, *i.e.*, the light-load losses are much lower. Where the load varies considerably, as in a single colliery, this is an advantage, but when a group of collieries can be supplied from a central station the load is very uniform owing to the diversity factor of the various compressed-air-consuming machines and the receiver effect of large mains.

Experience with the synchronous motor-driven compressors has been satisfactory, but the starting gear has given some trouble; failures in auto-transformers all showed signs of abnormal mechanical stresses and excessive burning of the

switch contacts. It was found that the arc drawn out on the starting-switch contacts was maintained for a length of time sufficient to cause a short circuit in the circuit formed by the transformer coils, the switch "starting" and "running" contacts, and the connection from the transformer taps to the motor (see fig. 4). The trouble was overcome, first, by closing the transformer neutral later and opening it earlier and, secondly, by closing the running switch slowly, giving ample time for the arc on the starting contacts to be quenched. Even smoother starting is obtained by the Korndorfer method, which uses the transformer windings as choking coils. *(To be continued.)*

Discussion in London.

Mr. C. P. SPARKS opened the discussion by pointing out, in connection with the author's comparison of the cost of steam and electrical operation, that the ease with which measurements could be made with the electric drive had helped materially the change over. Amongst the advantages and economies of conversion to electrical operation was a saving of from ¼ to ⅓ of the fuel consumed. The details given in the paper regarding synchronous motors and control gear were very valuable; he remembered deciding with the late Mr. George Hann to embark upon the improvement of power factor at the very first opportunity. Concerning Table II, the 32 kWh consumed per ton of coal raised included a good deal of compressed air, and while he agreed that the efficiency of power transmission by means of compressed air was better than that of electrical transmission, there were other considerations; what about the efficiency of *use* of compressed air? They must improve electrical apparatus so that it would eliminate the use of air. There was also great need for better lighting at the coal face; it would reduce accidents and therefore costs, and would improve the efficiency of labour. Reliability was most essential in colliery power producing plant, and concerning low-grade fuel, it would not pay anybody to try to burn "dirt." Would low-grade, untreated, coals be suitable for pulverising? Reversing winder switches should be of the air break type; the low power factor arc energy would cause switches to fail at much lower kVA than their normal rating.

Mr. J. A. B. HORSLEY remarked that no reference had been made by the author to automatic speed control during the wind, which could not be put aside as an unessential refinement. It could be applied to a.c. and d.c. plant, and in one case at his request arrangements had been made for testing the gear at one-quarter speed as though it were operating at full speed.

Mr. J. H. JOHNSON, regarding the efficiency of power transmission by compressed air, pointed out that it was the efficiency of the whole plant that should be considered when a strict comparison was being made. The author had also been rather generous to the salient-pole motor; the cylindrical type machine had been applied to colliery work and had important advantages when reliability was remembered. Many collieries were being converted to electrical operation, and electrical engineers should fit themselves to give the advice they would be asked for.

Mr. T. J. SACK said that the paper had ignored the subject of lighting in mines. He had hoped that something would have been done on the lines indicated in Dr. W. M. Thornton's I.E.E. paper; that better lighting was urgently needed was proved by the thousands of pounds paid by mine owners as compensation for nystagmus, which was entirely due to deficient illumination.

Major E. IVOR DAVID, in reply, explained that the aim of the paper was mainly to convey an idea of the operating conditions at a colliery. As Mr. Sparks knew, they had automatic winder speed control, and he agreed that by studying the arc in air-break switches manufacturers could probably improve oil-immersed switches; there was a much bigger arc when the switch functioned with the machine carrying magnetising current only than when it was fully loaded. To the use of compressed air there was no alternative when the men refused to have electrical machinery. He was by no means an opponent of the synchronous induction motor; he probably had more of that type of machine under his care, and had installed more of them in the last two years than any other engineer in this country, but it was not a universal machine. One speaker seemed to be under the impression that the miner's lamp bulb was inefficient, but it was really the battery that was at fault and caused the maintenance of such lamps to be very costly.

On account of the lateness of the hour the discussion was brief.

The Electrical Imports of Peru.

THE following figures show the values of the imports into Peru of electrical goods and apparatus in 1923. Where comparative figures for 1922 are available they also are given, together with a note of increases or decreases. The Peruvian £ = about 20s.

	1922 £P	1923 £P		£P
Electrical accessories, e.g., switches, cut-outs, plugs, lampholders—				
Total	*	21,000		—
From Germany	—	9,000		—
„ Great Britain	—	11,000		—
Accumulators and batteries—				
Total	5,000	12,000	+	7,000
From Germany	4,000	8,000	+	4,000
„ United States	—	1,000	+	1,000
Insulators and tubes—				
Total	10,000	8,000	−	2,000
From Germany	1,000	2,000	+	1,000
„ United States	5,000	5,500	+	500
„ Great Britain	2,500	700	−	1,800
Copper wire, covered, except with silk, up to 3 mm. in diam.				
Total	8,000†	13,500	+	5,500
From Germany	1,000	3,000	+	2,000
„ United States	5,500	7,500	+	2,000
„ Great Britain	1,000	2,000	+	1,000
Ditto more than 3 mm. in diam.				
Total	26,000†	32,500	+	6,500
From Germany	1,500	3,500	+	2,000
„ United States	15,000	12,000	−	3,000
„ Great Britain	6,000	2,000	−	4,000
„ Italy	3,000	15,000	+	12,000
Telegraph apparatus, including wireless—				
Total	4,000	3,000	−	1,000
From United States	2,500	700	−	1,800
„ Great Britain	500	2,500	+	2,000
Telephone apparatus—				
Total	(Included	4,000		—
From United States	in	3,000		—
„ Great Britain	above)	200		—
Lighting fittings—				
Total	*	18,000		—
From Germany	—	9,000		—
„ United States	—	6,000		—
Heating and cooking apparatus—				
Total	*	1,500		—
From Germany	—	500		—
„ United States	—	900		—
Cables (copper)—				
Total	‡	86,000		—
From Germany	—	1,400		—
„ United States	—	3,000		—
„ Italy	—	79,000		—
Electric bells—				
Total	400	700	+	300
Insulating tape—				
Total	1,600	1,700	+	100
Covered copper flex—				
Total	4,300	8,400	+	4,100
From Germany	2,100	3,200	+	1,100
„ United States	1,800	3,500	+	1,700
Meters and instruments—				
Total	*	2,800		—
From Germany	—	1,600		—
„ United States	—	1,000		—
Metal filament lamps—				
Total	17,000	24,000	+	7,000
From Germany	9,500	12,800	+	3,300
„ United States	6,000	8,000	+	2,000
„ Holland	400	2,400	+	2,000
Magnetos—				
Total	*	1,300		—
From Germany	—	300		—
„ United States	—	700		—
Electric light meters, domestic—				
Total	*	4,000		—
From Germany	—	3,700		—
Motors up to 1 h.p.—				
Total	*	1,400		—
Switchboards—				
Total	*	3,000		—
From Germany	—	1,400		—
„ United States	—	600		—
„ Great Britain	—	500		—
Fans—				
Total	1,300	1,500	+	200
From Germany	400	400		—
„ United States	800	300	−	500
„ Italy	—	600	+	600
Total of electrical goods and apparatus	130,000	265,000	+	135,000
From Germany	33,000	63,000	+	30,000
„ United States	69,000	79,000	+	10,000
„ Great Britain	17,000	12,000	−	5,000
„ Italy	4,000	99,000	+	95,000

(*) Not shown separately. (†) Includes cable in this year.
(‡) Included in copper wire-covered in this year.
(§) Practically all cables.

Parliamentary.

(By Our Special Parliamentary Reporter.)

Trusts and Combines.—On February 17th Mr. A. V. ALEXANDER asked leave to introduce a Bill to provide for the collection of information with respect to trusts and combines. He explained that the Bill proposed to give authority to the Board of Trade to make recommendations, either on its own initiative or on receipt of complaints from persons who felt that they were being injured by the operation of trusts and combines, and to give statutory powers for the investigation of costs of production and distribution and the amount of profits at all stages. The Bill provided penalties for failing to comply with these provisions; also it provided that the Board of Trade should have statutory authority to make an Order abolishing any abuse or injury caused by the operation of a trust or combine which was proved after inquiry. Giving an example of a war-time trust, Mr. Alexander quoted from the report of the Standing Committee on Trusts, 1919, on electric lamps.

Leave was granted, and the Bill was brought in and read a first time.

Delayed Applications for Telephones.—On February 17th SIR W. MITCHELL-THOMSON informed Mr. Hannon that at January 31st there were in hand 2,900 applications for telephones, the completion of which was temporarily delayed pending the provision of additional plant or the granting of wayleaves. The number of new telephones installed during the last six months of 1924 averaged 17,345 a month.

Electrical Development.—On February 17th Mr. CLARRY asked the Minister of Transport what progress had been made by his Department in investigating the problem of electrical development in the country.

COLONEL W. ASHLEY said the examination of a problem such as electrical supply was a complicated matter, and he was afraid it was not possible to define the exact progress which was made from day to day. The whole matter was being most carefully investigated, and a review of the general position was proceeding.

Miners' Lamps.—On February 17th Mr. POTTS asked the Secretary for Mines when the Miners' Lamps Committee's Report, 1924, would be approved and operated; and whether he would consider amending the Coal Mines Regulation Acts, to enforce, in the interest of safety, that lamp renewal parts should bear the maker's name and be purchasable only through the lamp-maker who actually supplied the lamps in each particular mine.

COLONEL LANE-FOX said that the report contained numerous recommendations. Some were addressed to the industry and needed no action by the Mines Department; to some effect had already been given—including the important recommendation that a gauze of a more open mesh should be permitted in flame safety lamps—and some were still under discussion. The particular recommendation to which the hon. member referred was one on which opinion was much divided and which, after very careful consideration, he did not see his way to accept.

North Metropolitan Electric Power Supply.—On February 17th MAJOR MALONE asked the Minister of Transport whether he contemplated making an Order under Section 15 of the Electricity (Supply) Act, 1919, to enable an electricity company to abstract a large quantity of water for condensing purposes from one of the storage reservoirs of the Metropolitan Water Board; whether he was aware that the water which it was proposed to abstract had been stored and partially purified in this reservoir specially constructed for the purpose at considerable expense by the water consumers of London; and whether, in view of the far-reaching nature of the proposal, he had considered the possible injurious effect thereof upon the purity of water supplies generally.

COLONEL ASHLEY said that an application for the issue by him of such an Order had been made by the North Metropolitan Electric Power Supply Co., and on December 1st last he caused the customary notice of his intention to make the Order to be issued so as to give an opportunity for the lodging of objections. An objection had been lodged by the Metropolitan Water Board, and no action towards the issuing of an Order would be taken until an inquiry had been held.

Telephones on Liners.—On February 17th SIR H. BRITTAIN asked the Postmaster-General whether his attention had been called to the effort now being made to establish telephonic communication between American and German liners and telephone subscribers in their respective countries.

SIR W. MITCHELL-THOMSON stated that similar experiments had been made in this country during the last two years and were being continued. Promising results had recently been obtained, but the matter was still in the experimental stage.

Cost of Wireless Licences.—On February 17th Mr. T. HENDERSON asked the Postmaster-General whether he was aware that on July 1st, 1924, the cost of wireless licences was reduced from 15s. to 10s., and that great dissatisfaction existed owing to the refusal of his Department to grant a rebate to licence holders who had been charged the higher rate.

SIR WM. MITCHELL-THOMSON said that any refundment would not be practicable under the financial provisions of the agreement between the Post Office and the British Broadcasting Co.

The William Preston Indemnity Bill.—This Bill, which indemnifies Mr. W. Preston, who was elected M.P. for Walsall last year, and recently unseated on petition, from any penal consequences for which he may be liable for sitting in Parliament while labouring under disqualifications, passed through all its stages last week. It will be remembered that Mr. Preston held two very small Post Office contracts at the time of his election.

London Electricity Bills.—On February 19th, the London Electricity Supply Bills (Nos. 1 and 2) came up for second reading. No. 2 Bill was taken first and its rejection was moved by Mr. SCURR, a London Labour member, on the following grounds:—"That this House, whilst earnestly desiring the better organisation of the electricity supply industry on lines which further the public interest, declines to proceed with a Bill which is based on the principle that the industry shall be developed on the lines of a private trust instead of a public service, which prevents the people of London, by postponing purchase until 1971, from exercising the right of municipal purchase in 1931, and legalises a sliding scale involving high profits that will be injurious to the interests of the consumers and retard the maximum development of the industry."

Mr. GILLETT, another London Labour member, seconded the rejection.

Lt.-Col. MOORE BRABAZON, the Parliamentary Secretary to the Ministry of Transport, held that if the scheme embodied in the two Bills were put into operation it would not run counter to any plan which the Government might have for the national development of electricity, and the Government would like the Bills to be given a second reading. It had been the ideal of the Electricity Commissioners to get a London electricity authority, but the difficulties in the way had been great. There were 81 electricity undertakings in London—41 in the hands of municipalities and 40 in the hands of private companies. The private companies could be purchased by the London County Council in 1931. They were to be bought out on the same basis as tramways under the Tramways Act, which had been interpreted in the Law Courts as the cost of replacing the actual plant *in situ* and the cost of the buildings. The cost of buildings and plant had gone up and in spite of the depreciation of machinery there was little doubt that from the point of the public purse the London County Council would save money by the particular method that was to be adopted. The average interest upon the whole capital of the companies was 6¼ per cent. They could not pay more than 7 per cent. on their ordinary shares. Any profit over 7 per cent. was to go, as to three-quarters to the reduction of the rates, and as to the remaining quarter, an eighth to the employés and an eighth to the shareholders. After paying a tribute to the work of the Electricity Commissioners he said that the answer to the question as to what London got from the extra franchise that was being given to the London companies was that the private companies came in under a joint authority and agreed to be bound by a technical scheme which the joint authority imposed on them, always, of course, with the consent of the Electricity Commissioners. That was really getting the whole of London electricity into one organised whole. London Electricity Supply Bills No. 1 and No. 2 concerned an agreement between the companies and the London County Council, and the whole object of these Bills was to start the joint authority.

Proceeding to give a picture of London's electricity in the future, the hon. member said that the average consumption of electricity to-day throughout England was 100 kWh per year per person. In America it was 500 kWh. The total generating plant in London to-day was 675,000 kW. To satisfy a demand in London of 500 kWh per person per year would need generating plant of 2,000,000 kW and consequently London had to build in ten years to satisfy that demand 1,500,000 kW of plant. On the Joint Electricity Authority there would be a huge majority of municipal undertakings, so that one could not say for one moment that London electricity had been handed over to private enterprise.

In conclusion, he said that the Bills might not be ideal, but they were stepping-stones to that co-ordination which was the essence of cheap electricity for London.

In the debate which followed, many Labour members opposed the Bill, and Major ATTLEE urged the Government to try and improve the homes of the people by developing a domestic supply of cheap electricity.

Eventually, the No. 2 Bill was read a second time by 252 votes to 135—majority 117—and the No. 1 Bill was read a second time without a division.

Private Bills.—In the House of Lords, the Horley District Gas Company (Electricity Supply), the London & North-Eastern Railway (General Powers), the London, Midland and Scottish Railway, the South Wales Electrical Power Distribution Company, the Southern Railway, and the Uckfield Gas and Electricity Bills, have been read a first time; and the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Bill has been read a second time.

Telephone Service.—On February 18th, in the House of Lords, Lord LUCAN informed Lord SOUTHWARK that the total number of telephones installed by the Post Office amounted roughly to 17,000 a month at present, and some 77 per cent.

of the orders given were completed within four weeks. The number of telephone orders in hand now was 16,861, of which approximately 4,600 had been in hand for more than two months.

Broadcasting Licences. — On February 19th, Lord WOLMER, Assistant Postmaster-General, stated that the total number of annual broadcasting licences issued from November, 1922, up to the end of January, was about 1,942,000, including renewals of expired licences. Of these, about 1,200,000 were current. The total revenue collected was £1,108,000, of which about £850,000 accrued to the British Broadcasting Co. Payments to the company in respect of licence fees were made by monthly instalments in arrear, and the total amount paid up to February 1st was about £500,000.

Workshop Accidents.—On February 19th, Sir W. JOYNSON-HICKS, the Home Secretary, informed Lord H. Cavendish-Bentinck, that the total number of accidents reported under the Factory and Workshops Acts in 1924 was 169,726, of which 953 were fatal.

Electricity and Gas.

L.C.C. Committee's Report.

ON January 23rd, 1923, as the result of a motion by Mr. Morrison, the London County Council asked its General Purposes Committee to report whether or not recent enterprise on the part of certain Metropolitan electricity undertakings tended to show that gas was no longer necessary to the running of a house, either in respect of lighting, heating, or cooking. The Committee recently completed its study of the subject and its report was to come before the Council on February 23rd.

The report contains a review of the economics of electricity for lighting, heating, cooking and labour-saving. It is definitely stated that electricity is the best means available for artificial illumination. As regards heating, it is considered that the amount of energy required for the general heating of a house would, at present prices, prohibit the use of electricity for the purpose. On the other hand, the use of an electric radiator intermittently presents marked advantages. The heating of water for baths and general domestic use, at the present prices, may also be ruled out, except, possibly, by a combined use of thermal storage with a small amount of electrical energy on a 100 per cent. load factor. Developments may quite possibly take place on these lines. Cooking by electricity presents a more complex problem. The hot-plates on electric cookers cannot be regarded as so cheap or reliable as gas rings. For baking and roasting, however, electric ovens offer considerable advantage over gas ovens; they are not more costly to use, are reliable, and are capable of producing more consistent results than gas ovens. It is thought that once the difficulties of the hot-plate are surmounted, the electric cooker will be as good as the gas cooker. The use of electricity for small apparatus—kettles with internal heaters, electric irons, and small vacuum cleaners—has much to commend it. The cost of energy is small and quite out of proportion to the convenience gained. The apparatus should be hired out or some other method should be employed whereby the initial outlay would not prevent its adoption.

Unless the local electricity authorities are anxious to develop their domestic load, success cannot be reached; the public must be educated. In the past the gas companies have educated the public in the use of gas, and the electricity authorities must render a similar service in the use of electrical apparatus. The electricity department of the Borough of Hackney is instanced as working in this direction.

The report goes on to deal with the use of electricity in the Council's own dwellings. The substitution of electricity for gas for certain purposes in existing dwellings is costly. The St. Pancras Borough Council is doing this for lighting in some of its dwellings and has submitted similar proposals in connection with some of the Council's dwellings. The Borough Council's method is to bear the whole cost of the initial installation and to charge the tenant so much a week for an unlimited supply, subject to certain safeguards to prevent abuse. In the Housing Committee's opinion this system should be encouraged wherever possible. In three of the smaller L.C.C. estates arrangements have been made with local authorities to install electricity, and at another estate the Council is to take a bulk supply from a company. At Whiston House, in the Shoreditch Council's area of supply, it has cost the Council less to fit up the tenements electrically for all purposes than to install gas for lighting and cooking. These installations are in the nature of an experiment. With regard to the larger estates, the schemes usually provide for the laying of cables and ancillary apparatus. At the Bellingham estate, the South Metropolitan Electric Light & Power Co. offered to supply electricity for lighting purposes at £19 4s. a house. The South Suburban Gas Company, on the other hand, offered a supply of gas for lighting and cooking free of cost to the Council. Had electricity been introduced for lighting and gas for cooking, the cost to the Council would have been £25 4s. a house. In the case of the Roehampton estate, the cost to the Council of a supply from the County of London Electric Supply Company for lighting was found to be £20 a house, against a supply of gas for cooking and lighting of £10 a house. Electricity for lighting and gas for cooking would have cost the Council £25 a house. At Becontree, the Ilford Urban District Council was prepared to bring service lines for lighting into each house free of cost to the Council, but the Council would have had to wire each house at a cost of £15. For the introduction of gas for cooking only the gas company required a payment of £27 10s., so that the total cost would have been £42 10s. a house. The cost of introducing gas only for all purposes was £22 a house. In each of these cases gas lighting and cooking had to be decided upon for financial reasons.

In conclusion, the Committee says that whether recent enterprise on the part of certain local authorities owning electricity undertakings tends to show that gas is no longer necessary in the running of a house, either in respect of lighting, heating, or cooking, must remain largely a matter of opinion.

The Housing Committee expresses the opinion that, until further developments take place in the conditions governing electricity supply in Greater London, the supply companies will be loth to incur capital expenditure upon which they could not secure an adequate return before the date when their undertakings may be purchased from them. The possibilities of a general introduction of electricity into the Council's dwellings are small without the whole-hearted co-operation of the supply authorities, and proposals put forward by the Council would at present probably meet with varying degrees of success.

Legal.

An Electrical Hair-waving Apparatus Accident.

IN the King's Bench Division, Northern Ireland, Belfast, on the 17th inst., Miss Dorothy M'Dowell sued Richard Ferguson, Belfast, for damages for personal injuries sustained by reason of defendant's negligence, or his servants' negligence in the waving of her hair by electrical apparatus. Plaintiff said she went to defendant's hair-dressing establishment to have her hair waved. Some electrical apparatus was placed on her head and it ignited combs which had been placed on her hair, setting it alight and injuring her scalp. The plaintiff was awarded £325 damages.

False Pretences and Theft.

JOHN WALTER DONATI (29), a commercial traveller, Finsbury Park, was charged at Plymouth Police Court on February 20th with obtaining £2 by false pretences from Albert Ashley, a radio dealer, Plymouth, and with stealing 20 variometers, the property of Ernest Riches, carrying on a similar business at Devonport. The accused was found guilty and sentenced to six months' imprisonment.

Reviews.

Scientific Research and Human Welfare. By F. S. HARRIS, Ph.D., President of Brigham Young University, with the Collaboration of N. I. BUTT, B.S., Research Assistant, Brigham Young University. Pp. x + 406. London: Macmillan & Co., Ltd. Price 12s. 6d. net.

The importance of scientific research in promoting human welfare is so great, that one is always prepared to welcome any attempt to make the study of the subject more intelligible to the student. The continuous growth of scientific research induces in many minds a feeling of repletion, and it is sometimes pointed out that much of the work has no significance. The two great limitations on scientific research are the difficulty of finding men with proper training and vision to conduct the work, and of securing adequate funds with which to carry on the projects. With the advancement that is being made in every field of research there is simultaneously a contribution to human efficiency, health and comfort.

The author has shown in this volume how through diligent investigation man is learning many of the fundamental laws which control the forces of the universe. Through this knowledge fixation of atmospheric nitrogen, aerial navigation and wireless communication have been rendered possible, and these previously unknown forces of nature have been harnessed in the interests of human welfare. The guiding principle of the book is denoted by these words from the preface:—"The present volume is a record of contributions made by modest seekers after truth. Chapters record some of the romance of the conquest by man of the forces of nature. If the race is to progress it must continue its investigations; this calls for the expenditure of vast sums of money, not only by public agencies, but also from private funds." The book has been divided into sections, which deal respectively with health, communication, transportation, illumination, agriculture, engineering, manufacturing and the home. The authors have endeavoured to show some of the material transformations that have been made in human affairs through the discoveries of scientific research, the text being written in a fascinating and lucid manner, and the facts clearly set forth.

The book owes much to the matter taken from the reports of the U.S.A. National Research Council. It can be recom-

mended to the beginner and non-technical reader, as it contains a wealth of well-chosen descriptive material which is a valuable aid to a clear understanding of basic principles, so essential in the study of more technical literature.

The volume is written in a breezy and readable style, and will be useful in many ways, serving as an introduction to a more advanced treatise.

Small Electric Generating Sets. by W. WILSON, M.Sc., B.E., M.I.E.E., A.Am.I.E.E. Pp. 161; figs. 60. London: Ernest Benn, Ltd. Price 18s. net.

Most of us would probably be astounded to know the number of small generating sets in commission throughout the country, particularly in the rural parts where no public supply is available.

In providing a complete practical treatise on the installation and maintenance of small plants the author supplies a need felt by many interested or employed in this direction.

Although the principles discussed will hold good in many cases for larger machines, they are based on plant suitable for country house installations, up to about 6 kW capacity.

The book does not treat the two main subjects entirely separately, but rather together as parts of a common subject, dealing with the points of importance and interest in each in an order beneficial to the reader.

The first few chapters deal with the elementary mechanical and electrical principles, including the electric circuit, batteries, dynamos and motors. Few installations of the type described are complete without a battery, and the author deals extensively with the maintenance of small battery plants, paying particular attention to the charging of batteries.

The various methods of control, both mechanical and electrical, with and without battery working, make interesting reading and the pages on automatic operation for the starting and stopping of machines, and regulation during battery charging, are an outstanding feature of the book.

In dealing with internal-combustion engines, particularly gas engines, the author gives a very clear conception of the internal operations with the aid of many simple and clear diagrams and illustrations. Many makes of special machines are described and illustrated, such as portable X-ray sets.

A chapter on the commercial considerations of small installations enhances the value of the work, and the book is concluded with a most useful chapter on installation wiring.

Electric Cables. By W. A. DEL MAR. Pp. vii+208; figs. 58. London: McGraw-Hill Publishing Co., Ltd. Price 12s. 6d.

The work covers a somewhat wide range, from the manufacture of wire to the technical considerations and calculations necessary in the installation and maintenance of cables of all classes and under all conditions. In dealing with the insulating of cables, apart from the methods of insulating employed in the manufacture of cables, the author describes the methods of producing the actual insulating materials. Considerable attention is given to the question of the installation of underground cables with descriptions of some methods employed in practice, of jointing and the actual laying of cables. The testing of cables is dealt with both with regard to testing in the factory and after installation, and descriptions are given of some methods of testing employed in the localisation of faults, together with a chapter on insulation failures and dielectric strengths.

The chapter on the design of cables is the outstanding feature of the book and deals with the design separately from three points of view—to carry current, to stand pressure, and to withstand handling. This chapter is the outcome of several chapters completing a treatise on technical considerations of the behaviour of currents and pressures in cables under running conditions, with special attention to the question of waves and surges in cables. The book is provided with appendices dealing in tabulated form with the resistivity and conductivity of cables with varying temperature coefficients, and the calculations throughout are supported by curves and diagrams.

Storage Batteries. By G. W. VINAL, Physicist, Bureau of Standards, A.I.E.E. A General Treatise on the Physics and Chemistry of Secondary Batteries and Their Engineering Applications. Pp. viii+402; figs. 156. London: Chapman & Hall, Ltd. Price 22s. 6d. net.

The author has given an account of the available theory and practical applications of storage batteries, which have not been collected previously in so comprehensive or systematic a manner. Storage batteries are discussed from the chemical, physical and practical standpoints. Chemically, involving the nature and properties of the materials and reactions which occur during the charging and discharging; physically, dealing with the factors which affect the capacity and the theory of the transformation of the energy; and practically, it deals with the manufacture and the engineering applications of storage batteries. This volume will undoubtedly be of immense value to those engaged in the construction and operation of batteries; the subject matter is very clearly arranged, and passes from a brief introduction, dealing with the storage battery industry and the grouping of cells, to the materials and methods of construction of batteries, the purity and properties of the electrolyte, the theory of electric cells, lead-acid and nickel-iron cells, energy transformation and the capacity of batteries, and the operation, efficiency, testing and present-day uses of storage batteries. A feature of the treatise is the numerous references which appear throughout, and short bibliographies given at the end of each chapter. Due acknowledgement is made to various experts on storage battery work, who have made valuable suggestions during the compiling of the book.

The discussion of the various cell theories is necessarily technical in places, and the author has given a brief and highly serviceable *résumé* of the principal cell theories which have been proposed, *viz.*:—(1) The "Oxidation and reduction theory," which maintains that the lead peroxide is reduced to lead at the positive pole and the lead of the negative plate is oxidised during the process of discharge. (2) The "Occluded gas theory," which supposes the negative plates to occlude hydrogen and the positive plates oxygen, during the process of charging, the formation of lead sulphate on the plates being considered a secondary reaction, and an unmitigated evil. This idea has been perpetuated to the present time and forms the basis of much advertising of solutions to eliminate sulphation. (3) The "Double sulphate theory," proposed in 1882 by Gladstone and Tribe, who discovered that lead sulphate was formed at both plates as part of the process of discharge, the electrolyte becoming more dilute during the discharge. Frankland was the first to suggest utilising the change in specific gravity to indicate the state of charge of the battery. This theory is still vigorously criticised and contested by certain experts in America, but there is a preponderating amount of evidence in its favour, particularly from the thermodynamic standpoint. Slight reference is made by the author to the more modern cell theories, *viz.*, the "Persulphuric acid theory" and the "Higher oxide theory." In the former it is claimed that persulphuric acid and hydrogen peroxide are formed during the charging, and that the electromotive force of the cells depends on them; in the latter the active material of the positive plate is stated to be an oxide higher than the peroxide, and on discharge it is reduced to lead peroxide by hydrogen.

The book summarises a large accumulation of valuable information and reflects great credit upon its author for its practicability.

The Radio Year Book, 1925. Pp. xiv+175. Illustrated. London: Sir Isaac Pitman & Sons, Limited. Price 1s. 6d. net.

This is a year book of reference for those interested in broadcast receiving, and the scope this year has been greatly broadened in comparison with the two previous issues.

The book is divided into three sections, General, Technical, and Commercial.

The General section includes numerous photographs of the British Broadcasting Company's artistes and announcers, regulations regarding licences, descriptions of the principal broadcasting events of 1924, and articles on various aspects of broadcasting.

The technical section consists of authoritative popular articles on subjects connected with radio-signalling generally, including one on mercury rectifiers by Professor Fleming, and gives a list of the Radio Societies of Great Britain.

The commercial section deals with regulations concerning patents and trade marks, describes the constitution and aims of the commercial associations interested in the manufacture and supply of radio apparatus, and finishes off with a trade directory of radio firms.

The book should be useful and interesting not only to listeners, but also to those who cater for listeners.

The Broadcasting Time Table and Reception Log. Compiled by RONALD GRIERSON, A.M.I.E.E. Pp. 24. London: Chapman & Hall, Limited. Price 2s. 6d. net.

This is the first edition, dated October, 1924, and it is intended to issue revised editions periodically so that the information given may be kept up to date.

The object of the book is to assist the amateur experimenter in adjusting his apparatus for the reception of the principal European and American radio telephone stations which can be heard in this country, and to provide suitably arranged log sheets for recording his results.

In the log, the call signals, wave-lengths, and times of transmission are given on the left-hand pages, and facing them on the right-hand pages are the blank log sheets prepared in headed columns for the particulars of reception.

Other useful information is included in maps of the world, Europe, the British Isles; data concerning coils, valves, and time signals; and notes on reception, maintenance of equipment, and faults.

The book is well arranged and should prove useful to those who wish to test receivers and to make a practical study of reception phenomena.

"As Men Sow." By ROBERT BRYMER. London: G. T. Foulis & Co., Ltd. Price 7s. 6d. net.

"These newcomers are quite ordinary, but they seem to have some very nice friends!" Thus the landlady sums up her latest boarders, Mr. Pressem, the hopeful commercial traveller, and his energetic wife; and thus she might have summed up all the principal characters. The story centres round a prosperous, but unpolished, millowner and his escape-

grace brother, the one a promoter of good, and the other of evil. Righteousness prevails, and the evil characters all perish through their wickedness. The love scenes are unconvincing, and the speed of the narrative leaves the reader breathless, but the attention never flags. The interest of the novel lies in the faithful reproduction of the minute details of every-day life, of experiences common to ordinary people. The author is well known in the electrical trade, and is associated with Messrs. Siemens & English Electric Lamp Co., Ltd. This is not Mr. Brymer's first literary effort, as two previous books have been written by him, and we understand that they have enjoyed a wide circulation.

Electric Wiring. By A. A. SCHUHLER. Pp. vii+361; 305 figs. London: McGraw-Hill Publishing Co., Ltd. Price 12s. 6d.

This book treats the subject of the wiring for installations of lighting, bells and telephones, in a very simple and practical manner and should make a special appeal to the wiring apprentice and improver and a useful guide to the practical man.

The jointing of wires is very extensively dealt with and methods of sweating joints and using mechanical connectors are described and illustrated in detail, while instructions on the use of the blow-lamp render the descriptions on this subject complete as a practical treatise.

The chapters on bell wiring include the methods of connecting up special switches and contacts and of course batteries, while the subjects of indicators and burglar alarms, &c., are dealt with separately.

Many varied methods of house wiring are given, including the use of single- and multi-way switches, and planning for house wiring and lay-outs for all systems of wiring are dealt with extensively.

The chapters on telegraph and telephone wiring deal with both simple and complex circuits with the use of both batteries and magnetos, and the descriptions of the internal wiring of telephones will eliminate that feeling of "mystery" which overhangs the beginner when working on telephone installations. The simplicity of the diagrams is a special feature of the book.

The Four-Valve Combination Receiver. By W. JAMES. Pp. 8. Eight Plates and Circuit Sheets. London: The Wireless Press, Limited. Price 2s. net.

This is the latest and most ambitious of the Wireless Press Ezi-Wiring Series, the three previous publications having dealt with the construction of two- and three-valve receivers, and the amateur constructor would be well advised to try his hand at one of these three before tackling the four-valve combination.

That is not to say that Mr. James's circuit is unduly complicated, it is, in fact, commendably simple and is clearly and fully explained, but at the best the construction and operation of a four-valve receiver call for some previous experience if satisfactory results are to be obtained.

The receiver is arranged so that two, three or four valves can be used as required, the H.F. valve being cut out by a neat and novel arrangement. Complete working layouts are given with full descriptions, and an excellent wiring diagram in four colours is included.

It is claimed that this receiver will give loud speaker results from most of the British and Continental broadcasting stations.

The author rightly lays stress on the advantage of using reliable components, but, excepting in the case of fixed condensers, he gives no indication of the cost. The question of cost presents obvious difficulties but is unfortunately so important to us all that some approximate figures would have added to the value of his detailed constructional data.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

19,797. "Duplex telegraphy." Western Electric Co., Ltd. (Western Electric Co. Inc.). August 2nd, 1923. (228,211).

20,034. "Microphonic transmitters." E. A. Graham. August 4th, 1923. (228,212).

21,834. "Telephonic receivers." E. A. Graham. August 29th, 1923. (228,216.)

24,613. "Insulating material." British Thomson-Houston Co., Ltd. (General Electric Co.). October 3rd, 1923. (228,224.)

25,605. "Combined magneto and dynamo sets." C. A. Miller, F. J. Miller, and F. Hoffman. October 15th, 1923. (Cognate application 4,437/24.) (228,227.)

26,388. "Process for the production of compressed gas by electrolysis." P. Hausmeister. October 23rd, 1923. (228,231.)

27,046. "Means for cooling thermionic valves." B. D. L. Mogridge. October 29th, 1923. (228,243.)

27,058. "Magneto-electric machines." British Thomson-Houston Co., Ltd., A. P. Young, and L. Griffiths. October 29th, 1923. (228,246.)

27,066. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. December 23rd, 1922. (209,040.)

27,236. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. May 17th, 1923. (216,067.)

27,319. "Acoustic horns." Western Electric Co., Ltd. March 28th, 1923. (213,928.)

27,427. "Electric relays." A. Reyrolle & Co., Ltd., B. H. Lesson, Nalder Bros. & Thompson, Ltd., and F. H. Nalder. November 1st 1923. (228,265.)

27,446. "Electric inductance coils and formers therefor." E. C. W. Evans. November 1st, 1923. (228,267.)

27,489. "Electrical switching apparatus, particularly for automatic and semi-automatic telephone systems." Relay Automatic Telephone Co., Ltd., and G. E. Shklovsky. November 1st, 1923. (228,269.)

27,501. "Automatic switches as used in telephone systems." Automatic Telephone Manufacturing Co., Ltd., and J. Nixon. November 1st, 1923. (228,270.)

27,569. "Separators for electric storage batteries." Fuller's United Electric Works, Ltd., and W. L. Topple. November 2nd, 1923. (228,271.)

27,644. "Trolley or the like collector shoes for electric traction." S. Collinson and F. Coultas. November 3rd, 1923. (228,273.)

27,673. "Switching arrangements for electric sub-stations." A. Reyrolle and Co., Ltd., and R. C. Minton. November 3rd, 1923. (228,275.)

27,681. "Portable electric lamp standards." British Thomson-Houston Co., Ltd., and H. C. Wheat. November 3rd, 1923. (228,276.)

27,922. "X-ray photography." A. G. Bloxam (Akt. Ges. für Anilin-Fabrikation). November 6th, 1923. (228,279.)

27,928. "Electricity meters." Chamberlain & Hookham, Ltd., and S. James. November 6th, 1923. (228,280.)

28,036. "Electrical coils, more particularly for use in wireless telegraphy and telephony." J. Henderson. November 7th, 1923. (228,281.)

28,593. "Telephone systems." Coventry Automatic Telephones, Ltd., and J. E. Collyer. December 10th, 1923. (228,287.)

29,467. "Automatic and semi-automatic telephone systems." Relay Automatic Telephone Co., Ltd., and B. B. Johnson. November 22nd, 1923. (228,295.)

30,198. "Head-lamps for vehicles." Edison Swan Electric Co., Ltd., C. E. Hiatt, and P. J. Sturgess. November 30th, 1923. (228,299.)

30,793. "Electric cable joints." British Insulated & Helsby Cables, Ltd., and B. Welbourn. December 7th, 1923. (228,304.)

30,823. "Electric relays." T. W. Ross, C. Ryder, and Metropolitan-Vickers Electrical Co., Ltd. December 7th, 1923. (228,305.)

31,111. "Balancing of telegraph cables or lines." Muirhead & Co., Ltd., E. S. Hurtley, and B. Davies. December 11th, 1923. (228,309.)

31,516. "Governing system for prime movers." Metropolitan-Vickers Electrical Co., Ltd. January 3rd, 1923. (209,403.)

32,361. "Inductive coupling devices or transformers for electric circuits." E. C. R. Marks (Radio Frequency Laboratories, Inc.). December 27th, 1923. (228,315.)

32,561. "Dynamo-electrical machines." Villiers Engineering Co., Ltd., and F. Pountney. December 21st, 1923. (228,316.)

1924.

1,584. "Rheostats." Sterling Telephone & Electric Co., Ltd., W. D. Ward-Miller, and W. M. Holbeach. January 19th, 1924. (Cognate application 13,111/24.) (228,330.)

1,989. "Crystal detectors." British Thomson-Houston Co., Ltd., and A. T. Stace. January 24th, 1924. (228,334.)

2,133. "Frequency meters for electric currents." G. A. Cheetham and Metropolitan-Vickers Electrical Co., Ltd. January 26th, 1924. (228,337.)

2,687. "Large mercury-vapour rectifiers." Akt. Ges. Brown Boveri, et Cie. February 19th, 1923. (211,460.)

3,731. "Electric incandescent lamp bulb." E. Stiven. February 13th, 1924. (228,352.)

3,951. "Electrotherapeutic appliance." A. Lloyd. February 15th, 1924. (228,355.)

4,037. "Coil holders for radio service." M. H. Goldstone and C. J. Rodger. February 16th, 1924. (228,357.)

5,270. "Electromagnetic track brakes for railway and tramway vehicles and the like." N. E. North, A. D. Ferguson, and Metropolitan-Vickers Electrical Co., Ltd. February 29th, 1924. (228,367.)

5,505. "Electric contact devices operated by compasses." M. Schuler. March 6th, 1923. (212,549.)

7,183. "Electric battens, floats, and the like for stage lighting and for like purposes." E. F. Moy and E. F. Moy, Ltd. March 20th, 1924 (228,384.)

7,658. "Telephonic repeating systems." Western Electric Co., Ltd. (Western Electric Co. Inc.). March 26th, 1924. (228,387.)

9,013. "Electric transformers." British Thomson-Houston Co., Ltd. (General Electric Co.). April 9th, 1924. (228,398.)

9,021. "Electrical heaters for use in the permanent waving of hair." Nestle & Co., Ltd., and S. W. Bussell. April 9th, 1924. (228,399.)

12,680. "Electromagnetic permanent safety cut-out." G. Hubner. June 8th, 1923. (217,201.)

12,712. "Solenoid-operating mechanisms." British Thomson-Houston Co., Ltd. September 7th, 1923. (221,478.)

13,691. "Electric control systems." British Thomson-Houston Co., Ltd. July 19th, 1923. (219,286.)

13,871. "Safety appliance for storage batteries for motor vehicles." F. M. Blake. June 6th, 1924. (228,420.)

14,055. "Electric motor-starting switches." C. Jameson. June 10th, 1924. (228,422.)

14,375. "Systems of electric ship propulsion." British Thomson-Houston Co., Ltd. June 14th, 1923. (217,602.)

15,534. "Wireless systems." Rodo Patents, Ltd., and F. A. L. Sloot. June 27th, 1924. (228,428.)

15,806. "Variable resistance devices." Igranic Electric Co., Ltd., and A. H. Curtis. July 1st, 1924. (228,432.)

17,554. "Devices for mechanically controlling a set of pneumatically-operated electric switches." G. Meyfarth and Soc. Anon. des Ateliers de Secheron. September 4th, 1923. (221,482.)

18,729. "Variable condenser." I. P. Rodman. August 6th, 1923. (220,312.)

22,062. "Electric switchgear." International General Electric Co. Inc. October 8th, 1923. (223,207.)

24,144. "Rheostats." T. N. Cole, G. L. Ward, and R. P. Richardson. October 13th, 1923. (Divided application on 25,598/23.) (228,481.)

25,052. "Sleepers for railways, tramways, and the like." F. J. Davis. October 21st, 1924. (Addition to 206,254.) (228,483.)

25,370. "Wireless receiving apparatus." Telefunken Ges. für Drahtlose Telegraphie. October 24th, 1923. (223,928.)

25,772. "Mountings for conductors in electrical machinery." Waywood-Otis, Ltd. November 5th, 1923. (224,525.)

25,813. "Mercury-vapour rectifiers." Akt. Ges. Brown, Boveri et Cie. October 29th, 1923. (244,236.)

27,560. "Locomotives having combined internal-combustion and electric propulsion systems." Sulzer Frères Soc. Anon. December 15th, 1923. (226,177.)

American Patent Law.—A special committee is at work in Washington, U.S.A., in connection with the proposed amendment of the American patent law with the object of expediting and simplifying the handling of patent applications. Among the matters under consideration are the projected appointment of an Examiner of Interferences, from whose decision on patentability and the right to make the claims no appeal shall lie, except from a final decision terminating the interference; the scope of appeals to the Commissioner of Patents; and the period to be allowed for answering Patent Office action.